

144/440MHz FM DUAL BANDER

# TM-702A/E

## SERVICE MANUAL

# KENWOOD

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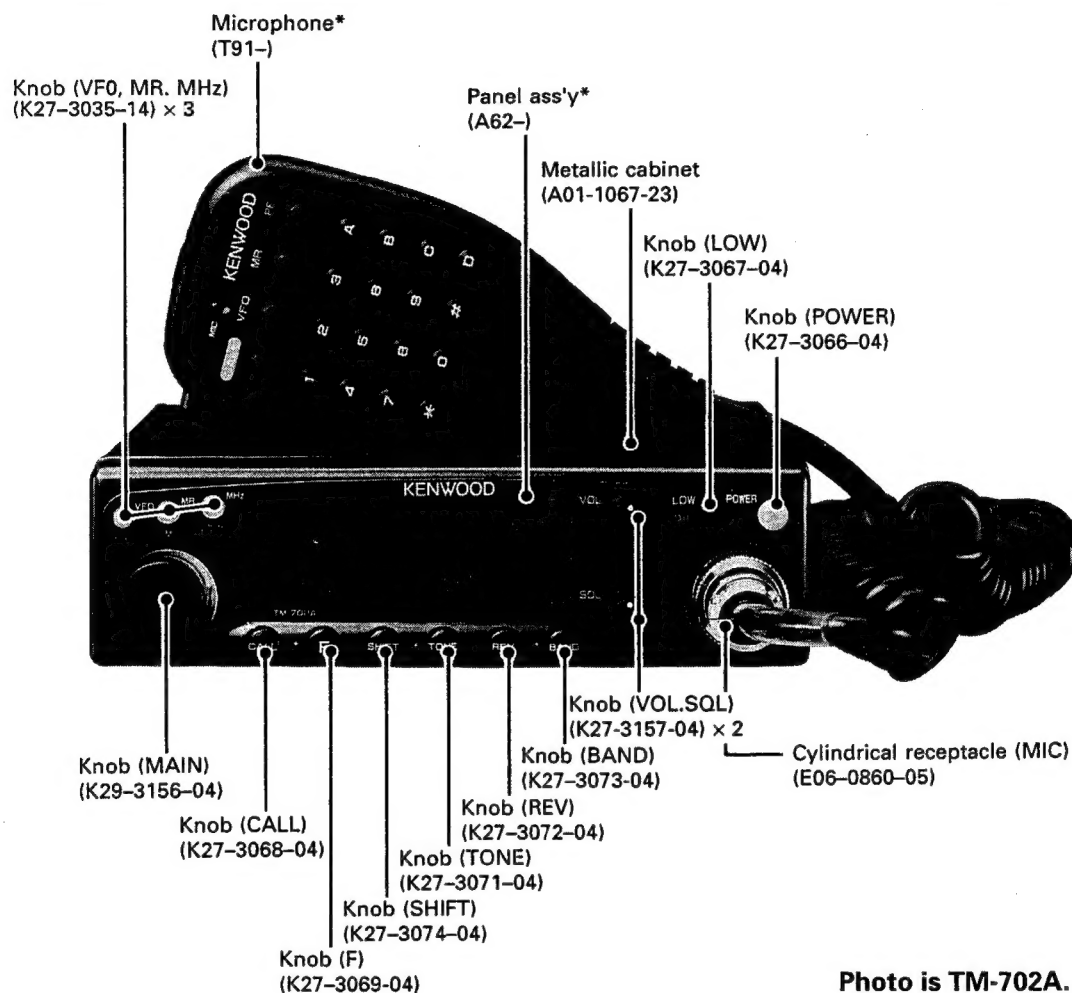


Photo is TM-702A.

\*Refer to parts list on page 18.

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# TM-702A/E

## CIRCUIT DESCRIPTION

### Frequency Configuration

The TM-702A/E incorporates a PLL synthesizer that works with a digital VFO and allows channel steps of 5, 10, 12.5, 15, 20, or 25kHz to be selected.

In the 144MHz-band receiver, an incoming signal is down converted to the 1st IF of 30.300MHz (E. E2, M. M2) and 16.900MHz (K. P) using a 1st local oscillator frequency of from 113.7 to 115.7MHz (E. E2), 113.7 to 117.7MHz (M. M2) and 127.1 to 131.095MHz (K. P). The 1st IF signal is then mixed with the 2nd local oscillator frequency of 29.845 MHz (E. E2, M. M2) and 17.355MHz (K. P) to produce the 2nd IF of 455kHz.

In the 430MHz-band receiver, an incoming signal is down converted to the 1st IF of 30.825MHz (E. E2, M. M2) and 21.600MHz (K. P) using a 1st local oscillator frequency of 399.175 to 409.175MHz (M. M2, E. E2) and 416.4 to 428.395MHz (K. P). The 1st IF signal is further mixed with the 2nd local oscillator frequency of 30.37MHz (E. E2, M. M2) and 21.145MHz (K. P) to produce the 2nd IF of 455kHz.

Both the 144MHz and 430MHz-band receivers are double-conversion.

The transmitter consists of a PLL circuit, which allows direct modulation and direct frequency division in both bands. Signals from the PLL circuit are amplified by a power amplifier for transmission.

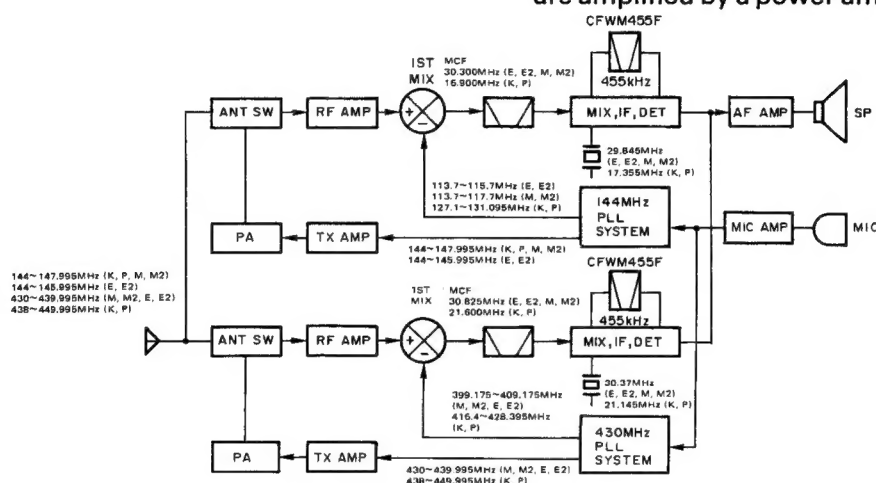


Fig. 1 Frequency Configuration

### Receiving System

#### • General

Separate receiver circuitry is provided from the antenna connector to the 2nd IF for both bands of the TM-702A/E.

#### • 144MHz band

Incoming 144MHz-band signals from the antenna are passed through a low-pass filter in the final block of the transmitter system, and are then switched to the front-end of the receiver system via a transmit/receive switching diode. This signal is then passed through an antenna matching coil and amplified by a GaAs FET. Undesirable components are removed from the signal by the bandpass filter that utilizes

three varactor diodes. The resulting signal is fed to the 1st mixer, which mixes the signal with the 1st local oscillator signal in order to obtain the 1st IF of 30.3MHz (E. E2) and 16.9MHz (K. P). This signal is then passed through two monolithic crystal filters (MCFs). The signal from the MCFs is used as the 1st IF signal.

The 1st IF signal is amplified and fed into IC11 (KCD04) in the FM IF HIC (HIC=Hybrid IC). The IF signal is mixed with the 2nd local oscillator signal of 29.845MHz (M. M2, E. E2) and 17.355MHz (K. P) to produce the 2nd IF of 455kHz. The 455kHz signal is then passed through an FM ceramic filter and fed into IC11 again for amplification. The output signal from IC11 is then fed into a power amplifier via the audio volume control and sent to the speaker.

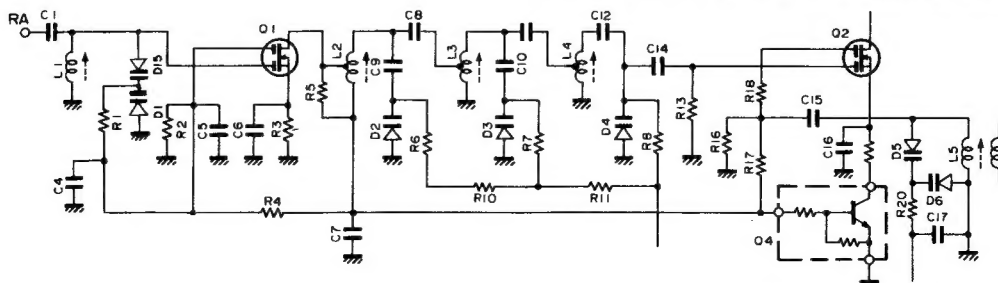


Fig. 2 144MHz front-end (varactor diode tuning)

## CIRCUIT DESCRIPTION

### • 430MHz band

Incoming 430MHz-band signals from the antenna are passed through a low-pass filter in the final block of the transmitter system and switched to the front-end of the receiver system via a transmit/receive switching diode. This signal is then passed through an antenna matching coil in the front-end and amplified by a GaAs FET and a junction-type FET. The signal is then fed into a two-pole helical resonator and fed into the 1st mixer. The 1st mixer combines the signal with the 1st local oscillator signal from the PLL and converts it to the 1st IF of 30.825MHz (E. E2. M. M2) and 21.6MHz (K. P).

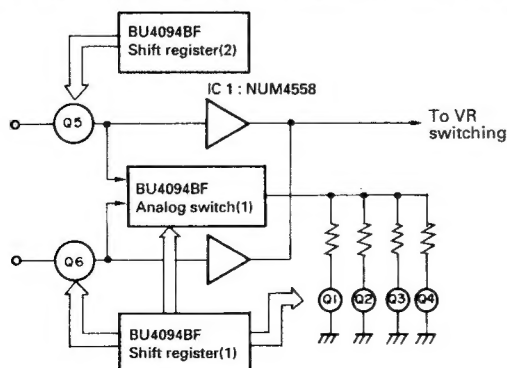
The 1st IF signal is amplified and fed into IC3 (KCD04) in the FM IF HIC (HIC=Hybrid IC). The IF signal is mixed with the 2nd local oscillator signal of 30.37MHz (E. E2. M. M2) and 21.145MHz (K.P) to produce the 2nd IF of 455kHz. The 455kHz signal is then passed through an FM ceramic filter and fed into IC3 again for amplification. The output signal from IC3 is then fed into a power amplifier via the audio volume control and sent to the speaker.

Item	Rating			
	E. E2. M. M2		K. P	
	L71-0263-05	L71-0294-05	L71-0252-05	L71-0276-05
Nominal center frequency	30.825MHz	30.3MHz	21.6MHz	16.9MHz
Pass band width	±7.5kHz or more at 3dB			
Attenuation band width	±28kHz or less at 40dB			
Ripple	1.5dB or less		1.0dB or less	
Insertion loss	3dB or less		2dB or less	
Guaranteed attenuation	60dB or more within ±1MHz		70dB or more within ±1MHz	
Terminating impedance	1.4kΩ/1pF	1.2kΩ/0.5PF	1.5kΩ/1pF	1.8kΩ/0PF

**Table 1 MCF** (TX-RX unit XF1) (L71-0262-05, L71-0252-05) (L71-0294-05, L71-0276-05)

Item	Rating
Nominal center frequency	455kHz ±1kHz
6dB bandwidth	±6kHz or more (from 455kHz)
50dB bandwidth	±12.5kHz or less (from 455kHz)
Ripple (within ±4kHz of 455kHz)	3dB or less
Insertion loss	6dB or less
Guaranteed attenuation (within ±100kHz of 455kHz)	35dB or more
I/O matching impedance	2.0kΩ

**Table 2 Ceramic filter CFWM455F (L72-0372-05)**



**Fig. 3 (1) Main and sub switching, sub-mute switching circuit**

### • S-meter circuit

The S-meter control voltage from IC3 and IC11 (KCD04) in the FM IF HIC is fed into the control unit. The CPU digitizes the analog voltage to operate the LCD bar meter.

### • AF section main and sub switching, sub-mute switching

The audio signal detected by the FM IF HIC is passed through AF mute Q5 and Q6 for VHF and UHF, and is output through the preamplifier.

When two signals are received at the same time, the attenuator is connected to the sub side by analog switch (1) BU4053BF, and the signals are mixed with the main output through the preamplifier, and are output. The attenuator on the sub side controls Q1 to Q4 with shift register (1) BU4094BF and is muted in 16 steps (0 to about 20dB).

### • VR switching

Normally, analog switch (2) BU4053BF operates so that the audio signal output from the preamplifier can be adjusted by the VR on the panel. When a remote controller is used, shift register (2) BU4094BF operates according to the data from the CPU, analog switch (2) BU4053BF is changed over, and the electronic VR LC7532M is controlled to adjust the level.

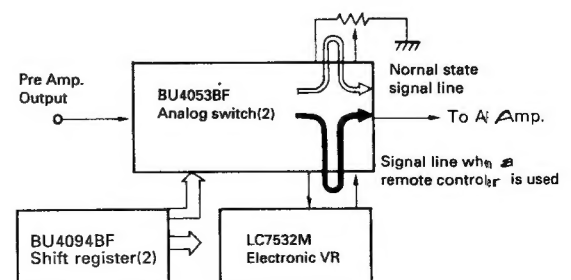
### • Shift register (1) (2)

The following control is executed by sending serial data from the CPU to the shift register (1) (2) (BU4094BF) in the electronic volume control module (X59-3800-00).

### Shift register (1) Shift register (2)

Pin No.	Pin name	Function	Pin No.	Pin name	Function
1	Strobe	Enable input (ES1)	1	Strobe	Enable input (ES1)
2	Data	Serial data input	2	Data	Serial data input
3	Clock	Clock input	3	Clock	Clock input
4	Q1	Sub-mute attenuator switching	4	Q1	TX power switching: "H" in LOW mode,
5	Q2		5	Q2	TX power switching: "H" in MID mode
6	Q3		6	Q3	"H" for VHF AF MUTE
7	Q4		7	Q4	
8	Vss	GND	8	Vss	GND
9	Qs		9	Qs	
10	Q's		10	Q's	
11	Q8	"H" UHF AF mute	11	Q8	"H" when electronic volume control is not used
12	Q7		12	Q7	"H" when electronic volume control is used
13	UP	"H" UHF main	13	UP	"L" when electronic volume control is UP
14	DWN	"H" VHF main	14	DWN	"L" when electronic volume control is DOWN
15	Output Enable	5V (Power)	15	Output Enable	5V (Power)
16	VDD	5V (Power)	16	VDD	5V (Power)

**Table 3**



**Fig. 3 (2) VR switching circuit**

# TM-702A/E

## CIRCUIT DESCRIPTION

### Transmitting System

#### • General

Separate circuits are provided for the 2 meter and 70 meter band, except for the mic amplifier and APC circuits.

#### • Modulation circuit

Audio signals from the microphone are fed into the mic amplifier for amplification, and then into two operational amplifiers. The operational amplifiers form a splatter filter and provide pre-emphasis, amplification, limiting, and removal of undesirable high-frequency components.

The modulation circuit directly frequency-modulates the VCO (Voltage Controlled Oscillator) signals for both the 144MHz and 430MHz bands using a varactor diode.

#### • Preamplifier circuit

The output signal from the VCO is applied to drive HIC IC9 (KCB05; two-stage linear amplifier) for the 144MHz band, and drive HIC IC10 (KCB04; three-stage linear amplifier) for the 430MHz band.

This amplifier is designed to cover a wide range of frequencies, and can produce stable output without adjustment. The APC control the collector voltage from the last stage of the amplifier.

#### • Power amplifier circuit

The drive signal is amplified to the required level by the power module. The signal is passed through a transmit/receive diode switch and filter, and output to the antenna.

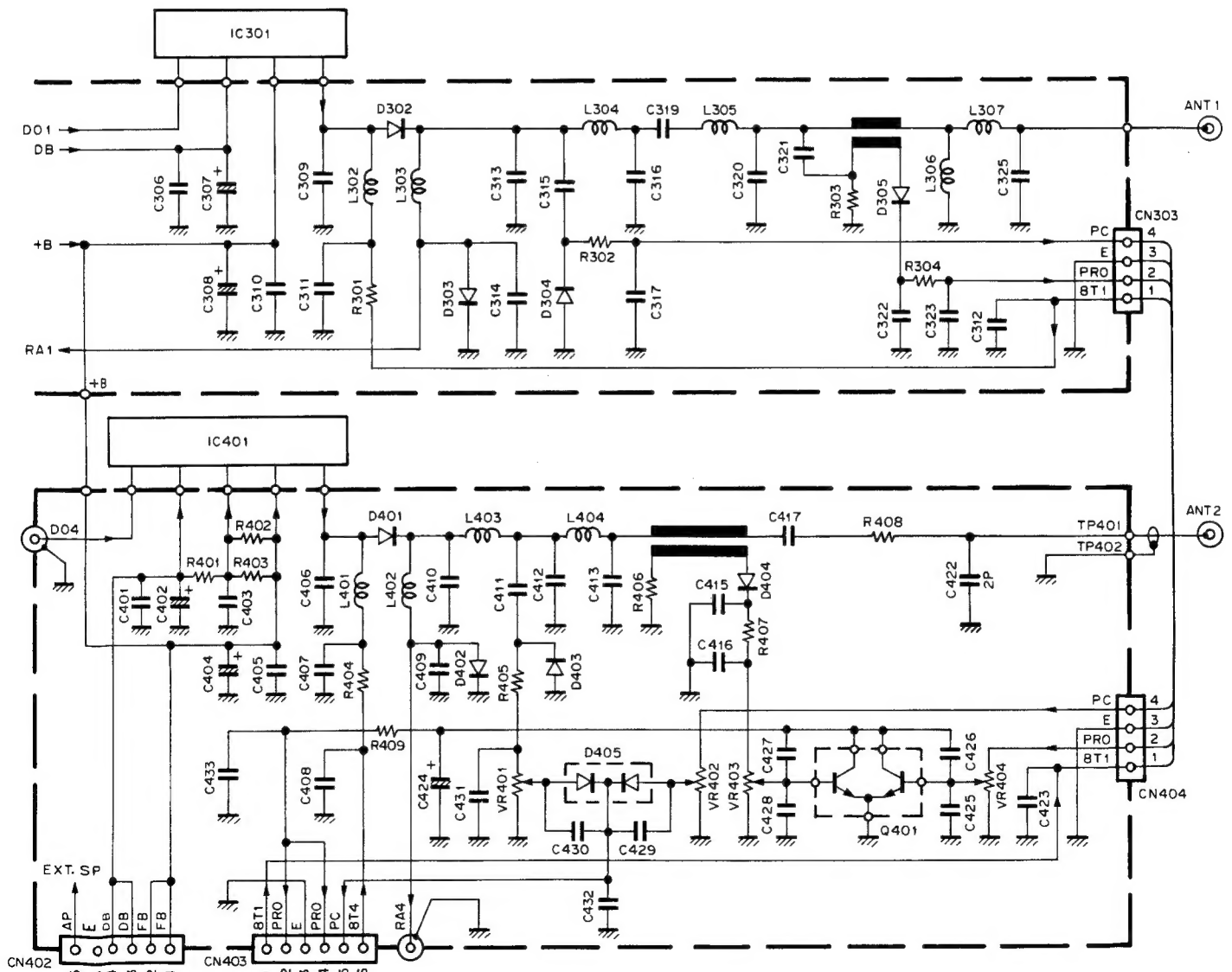


Fig. 4 Transmitting circuit

## CIRCUIT DESCRIPTION

### • APC (Automatic Power Control) and SWR (Standing Wave Ratio) protection circuits

The SWR protection circuit detects any reflected power produced by a mismatch in the antenna with a CM (CM=Capacitance matching) coupler and amplifies it. This circuit reduces the output control voltage and the gain to protect the power module.

The APC circuit detects a portion of the power module output and amplifies it to obtain a control voltage for output control. Since the output control voltage is inversely proportional to the output of the power module, the output is kept constant.

The power switching circuit uses the output of the shift register (BU4094BF) in the electronic volume control module (X59-3800-00). When the LOW switch on the panel is pressed and LOW is indicated, an "H" signal is output from pin 4 of the shift register (BU4094BF); this turns Q33 of the TX-RX unit on, selecting LOW power.

When the MID switch on the panel is pressed and MID is indicated, an "H" signal is output from Pin 5 of the shift register (BU4094BF); this turns Q32 of the TX-RX unit on, selecting MID power.

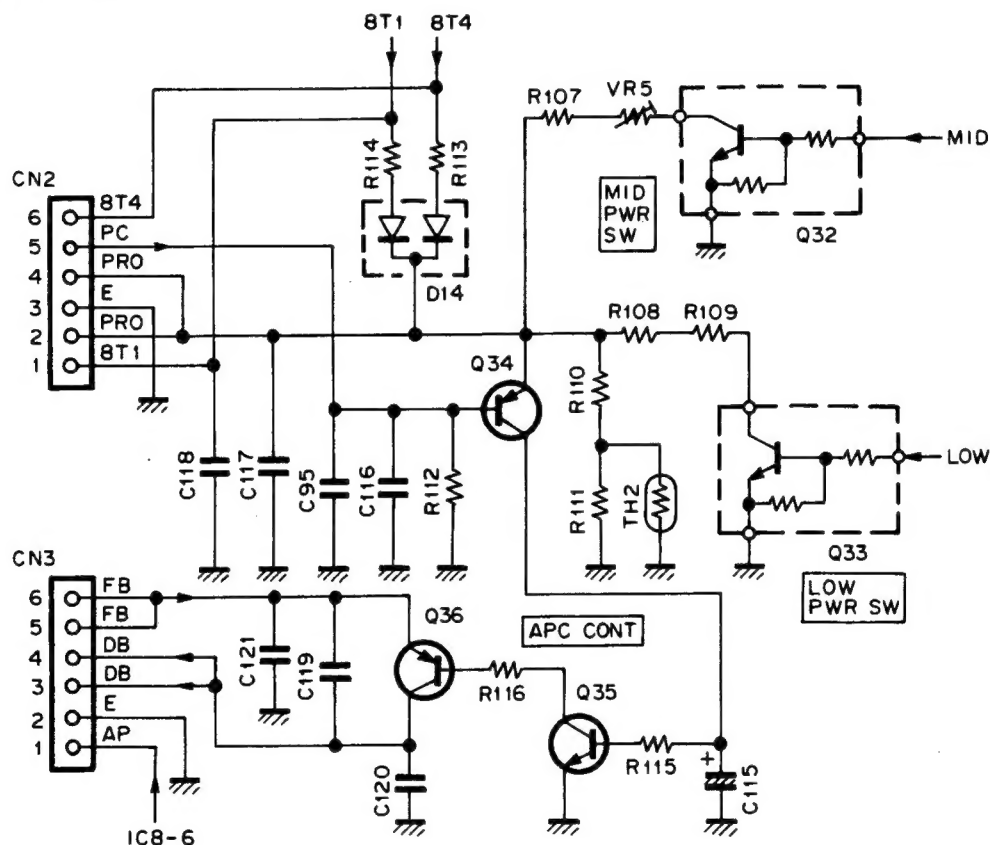


Fig. 5 LOW and MID power selection circuit

# TM-702A/E

## CIRCUIT DESCRIPTION

### PLL Synthesizer Block

The TM-702A/E PLL system is implemented as a sub-unit divided into upper VCO and lower PLL blocks. The 144MHz-band PLL block is independent of the 430MHz-band PLL block. The sub-unit is shielded to prevent external interference.

Two reference frequencies, 6.25kHz and 5kHz, are provided in order to allow 5, 10, 12.5, 15, 20, and 25kHz step operation by dividing the reference oscillator frequency of 12.8MHz by 2048 and 2560.

The VCO directly generates the target frequency. This signal is amplified once and then fed into a

pulse-swallow PLL IC for frequency division and phase comparison.

The 144MHz-band PLL system has two VCOs, one for transmission and one for reception. Using a signal ("H" in transmit mode) from pin 10 of the PLL IC (M54959FP), the LPF is deactivated by Q105 only for the instant when the TM-702A/E enters transmit mode. This helps produce a more rapid PLL lock-up.

The 430MHz-band PLL system has a single VCO for transmission and reception. Using Q5 as a switch, it reduces the PLL lock-up time in the same way as for the 144MHz section.

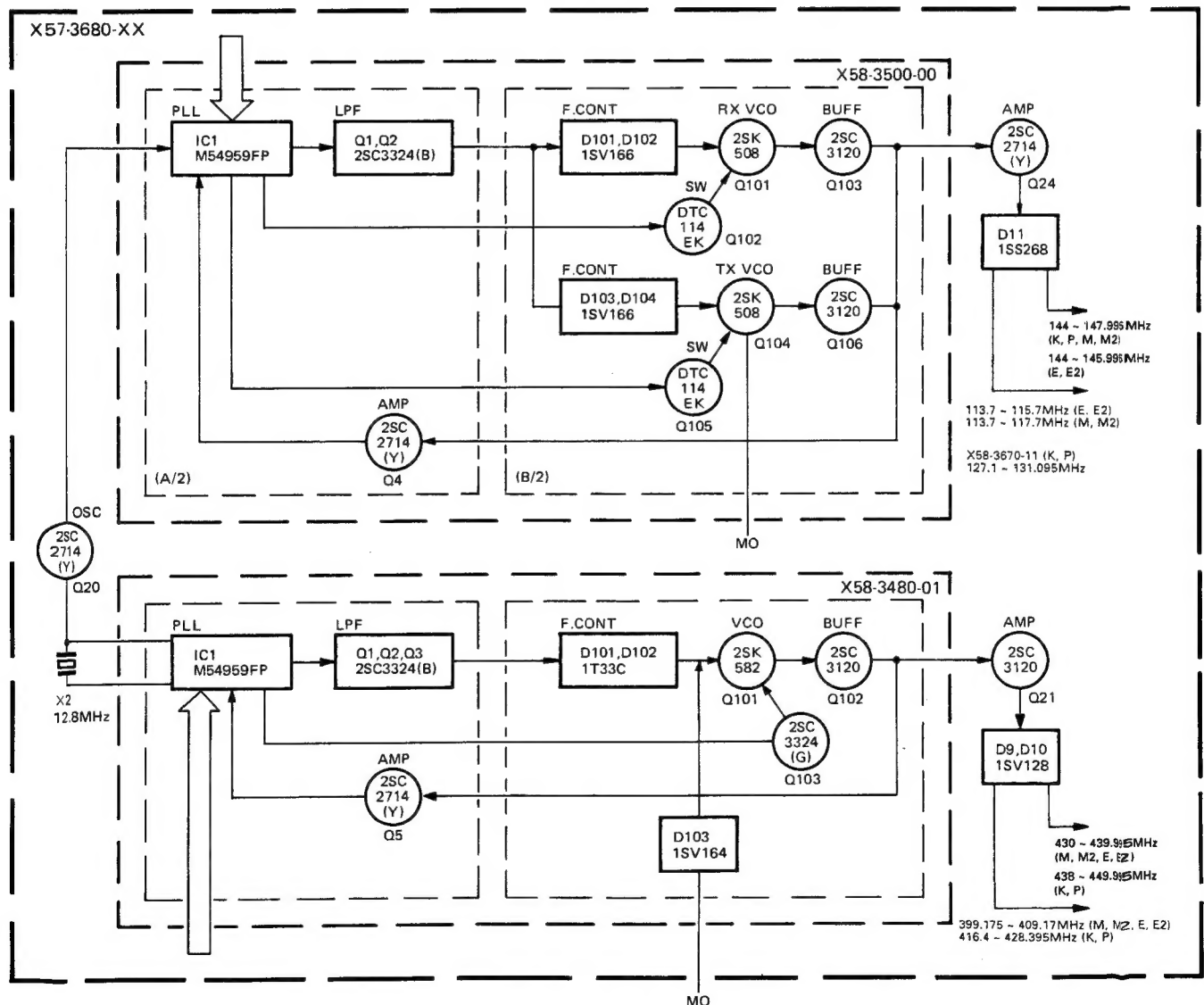


Fig. 6 PLL block diagram





## CIRCUIT DESCRIPTION

### • Reset and back-up circuits

When the power is turned on, the reset circuit sends an "L" level reset pulse to the RESET pin of the CPU for approx. 3ms. This initiates the power on reset sequence.

When the power is turned off, the back-up circuit detects a voltage drop in the 5C line and pulls the CPU INT4 pin to a "H" level. This causes the CPU to enter the back-up state.

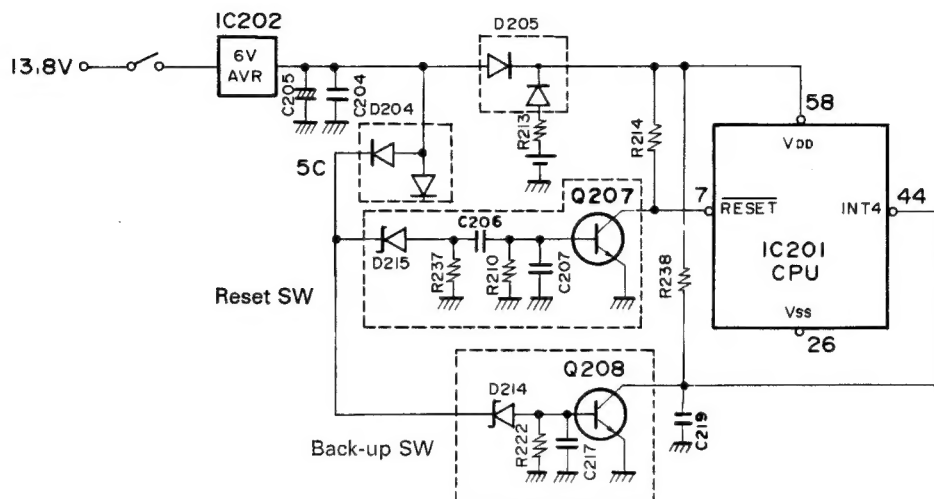


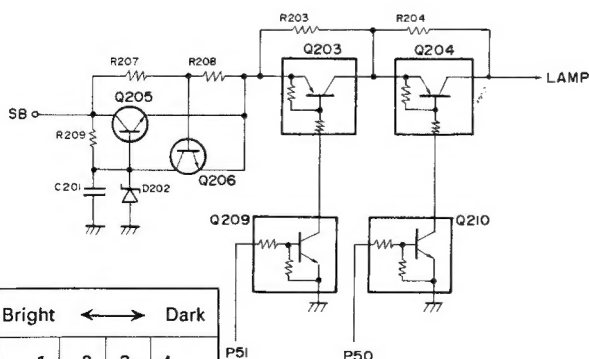
Fig. 9 Reset ad back-up circuits

### • Display circuit

The display circuit is contained in the LCD assembly. It consists of a LCD driver, its peripheral circuits, and an LCD. The LCD is dynamically operated with a 50% duty cycle. The LCD driver receives LCD data from P33, P141, and P140 of the CPU.

### • Dimmer circuit and reguated voltage circuit for lamp

The lamp circuit generates a constant voltage of about 8.8V with SB, Q205, and D202. The lamp circuit resistance is change by turning Q203 and Q204 on and off to control the dimmer. If the lamp is shorted, Q206 decreases the Q205 V<sub>BE</sub> to prevent an overcurrent from following through Q205.



Bright-ness	Bright ← → Dark			
	1	2	3	4
P50	H	L	H	L
P51	H	H	L	L

### • Shift register circuit

The following control is executed by sending serial data from the CPU to the shift register (MB88307PF) in IC5 (KCC03).

Pin No.	Pin name	Function
1	SO	
2	LOAD	Enable input
3	00	Normally, "H"
4	01	Normally, "H"
5	02	Normally, "H"
6	03	"L" in receive mode (144MHz band)
7	SC/SC	Clock input
8	Vss	GND
9	0E	GND
10	04	"L" in receive mode (430MHz band)
11	05	"L" in receive mode, "H" in transmit mode
12	06	"L" in transmit mode (144MHz band)
13	07	"L" in transmit mode (430MHz band)
14	SI	Serial data input
15	RESET	5V (Power)
16	Vcc	5V (Power)

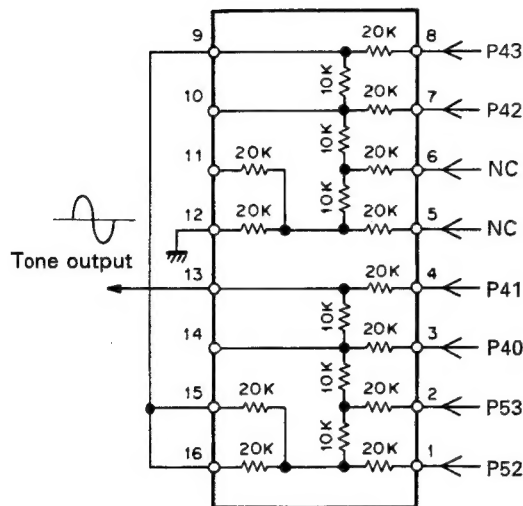
Table 4



## CIRCUIT DESCRIPTION

### • Tone generator circuit

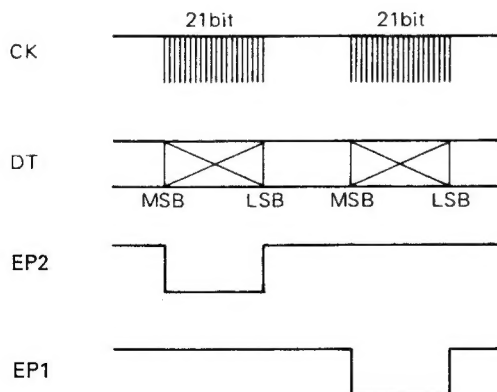
IC203 (ladder resistor network) receives analog signals from P40 thru P43 and P52 thru P53 of the CPU and digitizes them to produce 38 different tones from 67.0Hz to 250.3Hz. Figure 11 shows the internal configuration of IC203.



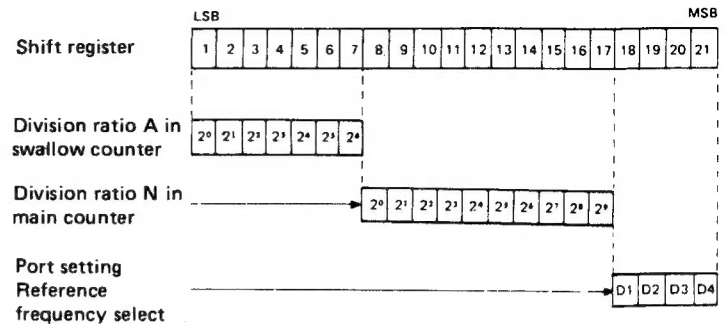
**Fig. 11 Internal configuration of ladder resistor network KRR-C001 (TX-RX unit IC203)**

### • PLL data output

PLL data is sent from P21 (CK), P22 (DT), P62 (EP2), and P23 (EP1) of the CPU. Figure 12 is a timing chart for PLL data transfer, and Figure 13 shows the format of PLL data.



**Fig. 12 Timing chart for PLL data transfer**



The 21-bit data is made up of the following:

#### 1. Division ratio data A and N (17 bits)

F (display -10.7MHz in RX mode)

$$= \{(N \times 128) + A\} \times 12.8\text{MHz/ref}$$

N: Division ratio set in 10-bit main counter (binary)

A: Division ratio set in 7-bit swallow counter (binary)

#### 2. Reference frequency (ref) select (2 bits)

Data		Phase reference frequency	
D1	D2		
L	L	5kHz	5, 10, 15, 20, 25kHz step mode
H	L	6.25kHz	12.5kHz step mode

#### 3. Switch select (2 bits)

Data		Output port		
D3	D4	SW1	SW2	
L	H	L	H	RX mode
H	L	H	L	TX mode

**Fig. 13 PLL data format**

# TM-702A/E

## CIRCUIT DESCRIPTION

### • Power switching circuit

The power switching circuit is an HIC that consists of a shift register (MB88307PF), 3-pin regulator (TA78L05F) that supplies 5V to the main unit, and three digital transistors.

The eight output pins of the shift register are controlled according to data from the CPU, and the power supply is switched depending on the state of the shift register.

	8R1	8R0	8R3	8R4	T1	8R8	8RU	T4
RX 144MHz band	H	L	L	L	H	L	H	H
TX 144MHz band	L	L	L	L	L	L	L	H
RX 430MHz band	L	L	L	H	H	L	H	H
TX 430MHz band	L	L	L	L	H	L	L	L

H:8V, L:0V

Table 5

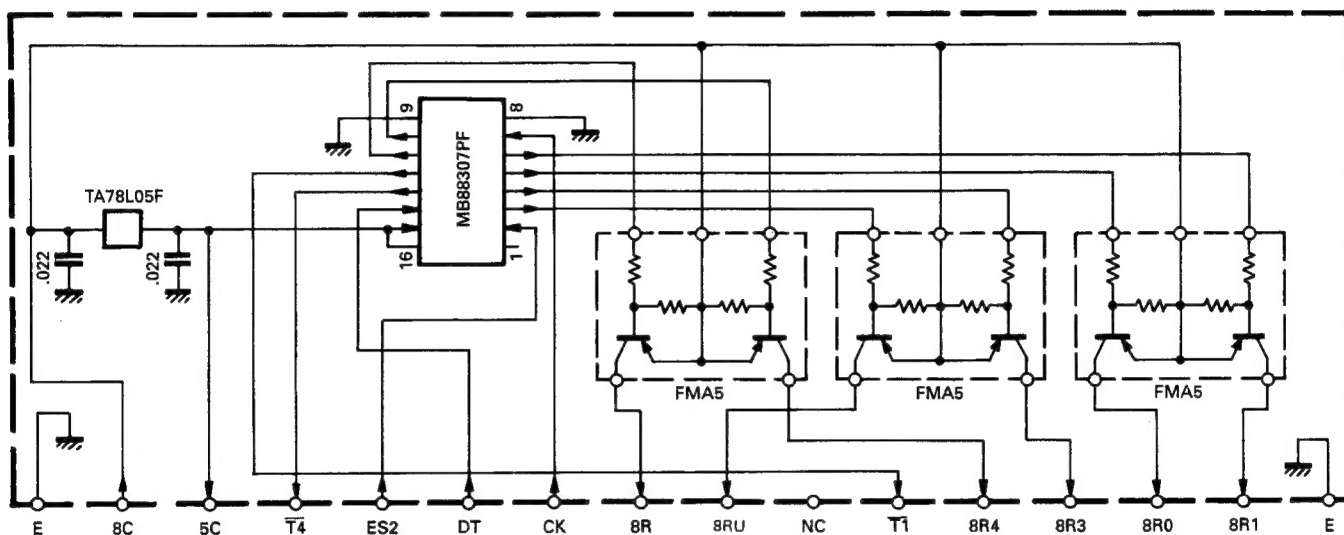


Fig. 14 Power switching circuit

### • Input and output of CTCSS unit (option)

The optional CTCSS unit receives data from P21, P22, and P73 of the CPU. Figure 15 is a timing chart for CTCSS data transfer, and Figure 16 shows the format of CTCSS data. When a tone from the CTCSS unit is detected, an "H" level signal is input to T10 of the CPU, opening the squelch.

### • Input and output of the remote control unit (option)

When the optional remote control unit is connected, an "H" level signal is input to INTO of the CPU, changing the function of the following pins.

- P03 → S1 : Serial data input pin
- P02 → S2 : Serial data output pin
- P01 → SCK : Serial clock I/O pin

### • Input and output of DTMF unit (option)

Data is transmitted to the DTMF unit by P60, P61, P81 and P90 through P93 of the CPU. The DTMF code is transferred by P90 through P93. When the DTMF code is read, signal is input to P60, and the code is read. When the DTMF is transmitted, data is transmitted to P90 through P93. When P61 goes high, a tone is output.

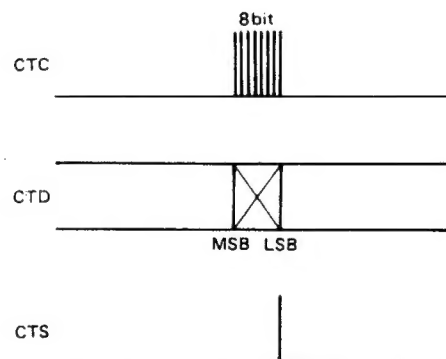


Fig. 15 Timing chart for CTCSS data transfer

Tone frequency select data for CTCSS unit

D1	D2	D3	D4	D5	D6
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Example : 88.5Hz L H L H H H

Fig. 16 CTCSS data format

## CIRCUIT DESCRIPTION

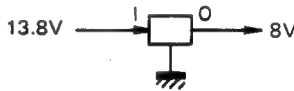
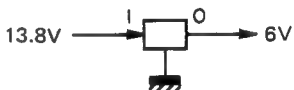
Pin No.	Pin name	I/O	Logic	Function	Pin No.	Pin name	I/O	Logic	Function
1	P41	O	-	D/A digital output (tone).	33	PTH01	I	-	Mic DOWN input.
2	P40	O	-		34	PTH00	I	-	Mic UP input.
3	P53	O	-		35	T10	I	H	CTCSS DET
4	P52	O	-		36	T11	I	L	BUSY input (VHF)
5	P51	O	-	DIMMER switch	37	P23	O	L	PLL IC enable output. (VHF)
6	P50	O	-		38	P22	O	-	Serial data output.
7	RESET	I	L	Reset input.	39	P21	O	-	Serial clock output.
8	X2	-	-	4.194304MHz crystal oscillator	40	P20	O	-	Beeper output.
9	X1	-	-		41	P03/SI	I/I	L/-	Mic DOWN/serial data input.
10	P63	I	-	Not used	42	P02/SO	I/O	L/-	Mic PTT input/serial data output.
11	P62	O	H	VHF PLL enable output. EP2	43	P01/SCK	I/-	L/-	Mic UP input/serial clock I/O.
12	P61	O	H	DTMF tone CE	44	INT4	I	H	Back-up detect input.
13	P60	I	H	DTMF signal check DV	45	P123	I	L	CALL, VFO
14	P73	O	H	CTCSS unit enable output.	46	P122	I	L	F, MR/M
15	P72	O	H	Shift register enable output. ESI	47	P121	I	L	SHIFT, MHz
16	P71	O	H	Shift register enable output. ES2	48	P120	I	L	TONE
17	P70	O	H	MIC mute	49	P133	I	L	REV
18	P83	O	H	DTMF receiver EN	50	P132	I	L	LOW, BAND
19	P82	O	H	Function control F.C.	51	P131	I	L	Transmit power select.
20	P81	O	-	DTMF switch DTSEL	52	P130	I	L	Busy input. (UHF)
21	P80	O	H	Shift register ST	53	P143	O	L	Squelch control.
22	P93	I	H	DTSS D4	54	P142	O	H	Power switch
23	P92	I	H	DTSS D3	55	P141	O	-	LCD driver clock output.
24	P91	I	H	DTSS D2	56	P140	O	-	LCD driver data output.
25	P90	I	H	DTSS D1	57	NC	-	H	Not used. (Connect $V_{DD}$ )
26	Vss	-	-	GND.	58	$V_{DD}$	-	-	Power supply pin.
27	INT3	I	L	Unit check	59	P33	O	-	LCD driver enable output.
28	INT2	I	-	Encoder input.	60	P32	O	L	Distination output.
29	INT1	I	-		61	P31	O	L	Key output.
30	INT0	I	H	Remote connect detect input.	62	P30	O	L	
31	PTH03	I	-	S-meter analog input. (UHF)	63	P43	O	-	D/A digital output (tone).
32	PTH02	I	-	S-meter analog input. (VHF)	64	P42	O	-	

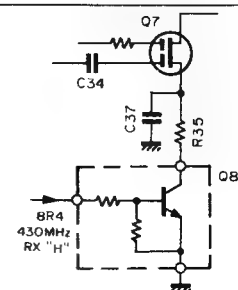
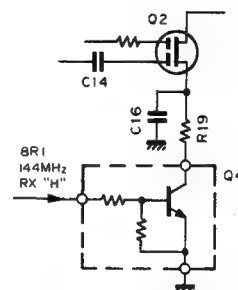
Table 6 75116GF terminal functions (TX-RX unit IC201)

# TM-702A/E

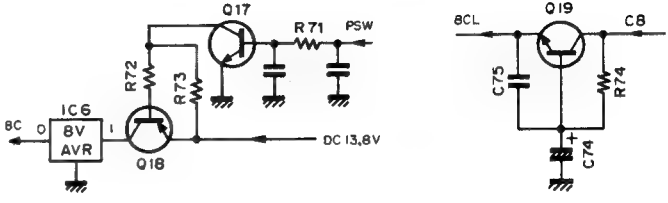
## DESCRIPTION OF COMPONENTS

TX-RX UNIT (X57-3680-XX) -11: TM-702A(K), -21: TM-702A(M), -22: TM-702A (M2)  
1-01: TM-702A(P), 2-71: TM-702E(E), 2-72: TM-702E(E2)

Component	Use/Function	Operation/Condition/Compatibility	
IC3 (UHF) IC11 (VHF)	2nd local oscillator, mixer, IF amplifier, detector, low-frequency amplifier, noise amplifier, noise detector, squench switch	<b>IC3</b> ① 1st IF signal input (30.825MHz: E. E2. M. M2, 21.6MHz: K. P) ③ ④ 2nd local oscillator (30.37MHz: E. E2. M. M2, 21.145MHz: K.P) ⑨ Scan control, busy signal, busy : 0V ⑩ Noise detection voltage output (DC) ⑪ S-meter output ⑫ Detection output ⑭ RD output ⑮ AF output	<b>IC11</b> ① 1st IF signal input (30.3 MHz: E. E2. M. M2, 16.9MHz: K. P) ③ ④ 2nd local oscillator (29.845 MHz : E. E2. M. M2, 17.355MHz: K. P) ⑨ Scan control, busy signal, busy : 0V ⑩ Noise detection voltage output (DC) ⑪ S-meter output ⑫ Detection output ⑭ RD output ⑮ AF output
IC5	Power switching	② 8V in receive mode (144MHz band) ⑤ 8V in receive mode (340MHz band) ⑥ 0V in transmit mode (144MHz band) ⑧ 8V in receive mode ⑩ 0V in transmit mode (430MHz band)	⑮ 5V output ⑭ 8V input
IC6	8V AVR	3-pin regulator	
IC7	10V AVR	② 10V output    ⑦ 13.8V input	
IC8	AF amplification	① AF input    ⑥ AF output	
IC9	144MHz-band transmit driver	Operates in transmit mode, 144 to 145.995MHz (K. P. M. M2) 144 to 147.995MHz (E. E2) ① Output    ⑩ Input	
IC10	430MHz-band transmit driver	Operates in transmit mode, 430 to 439.995MHz (M. M2. E. E2) 438 to 449.995MHz (K. P) ① Output    ⑩ Input	
IC201	Microprocessor	See Circuit Description	
IC202	6V AVR	3-pin regulator	
IC203	Tone A/D converter	① - ③ Input    ⑮ Output	
IC301	Power amplification	144MHz band M57737R	
IC401	Power amplification	430MHz band M57729	
Q1	High-frequency amplification	Operates in receive mode, 144MHz-band	
Q2	1st mixer	Operates in receive mode	
Q4	Receive band switching	On in receive mode, 144MHz-band	
Q5,6	High-frequency amplification	Operates in receive mode, 430MHz band	
Q7	1st mixer	Operates in receive mode	
Q8	Receive band switching	In receive mode, 430MHz band	

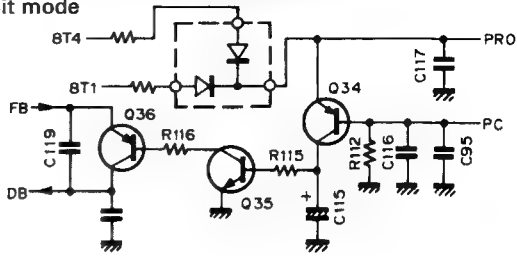
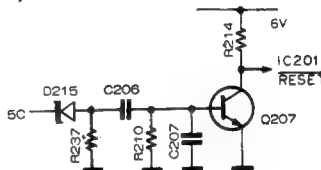
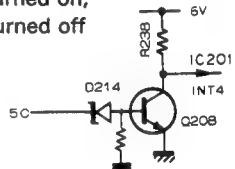


## DISCRIPTION OF COMPONENTS

Compornent	Use/Function	Operation/Condition/Compatibility
Q12, Q38	1st IF amplification	Operates in receive mode, Q12 (30.825MHz: E. E2. M. M2., 21.6MHz: K. P) Q38 (30.3MHz: E. E2. M. M2., 16.9MHz: K. P)
Q17, 18	Power switch	When power switch is ON, Q17 and Q18 are ON When power switch is OFF, Q17 and Q18 are OFF
Q19	PLL 8V ripple filter	
Q20	Buffer amplification	12.8MHz
Q21	430MHz band PLL output amplification	399.175 to 409.17MHz (M. M., E. E2), 416.4~428.395MHz (K. P) in receive mode, 430 to 439.995MHz (M. M2. E. E2), 438 to 449.995MHz (K. P) in transmit mode
Q22	Mic line mute	On in receive mode (430MHz band)
Q23	CV line buffer	144MHz band
Q24	144MHz band PLL output	113.7 to 115.7MHz (M. M2), 113.7 to 117.7MHz (E. E2), 127.1~131.095MHz (K. P) in receive 144 to 145.995MHz (E. E2), 144 to 147.995MHz (K. P. M. M2) in transmit mode
Q25	Mic line mute	On in receive mode, 144MHz band
Q26 ~ Q28	430MHz band 8T switching	In receive mode, Q29 : OFF Q27 and Q28 : ON
Q29 ~ Q31	144MHz band 8T switching	In receive mode, Q29 : OFF Q27 and Q31 : ON
Q32	MID power switch	ON in MID power mode
Q33	LOW power switch	ON in LOW power mode

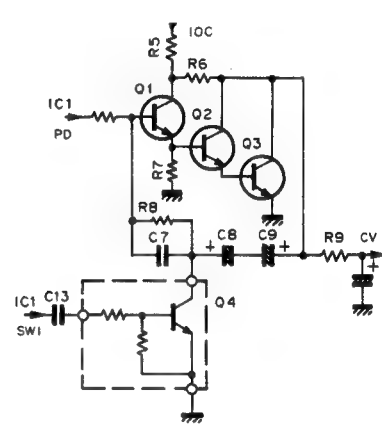
# TM-702A/E

## DESCRIPTION OF COMPONENTS

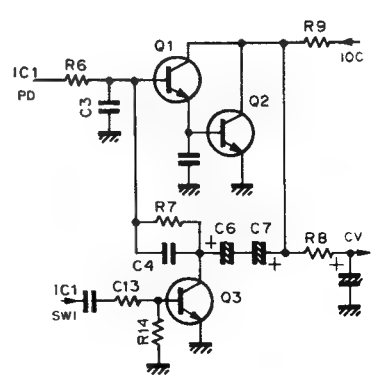
Component	Use/Function	Operation/Condition/Compatibility															
Q34 ~ 36	APC control	Operates in trasmit mode 															
Q201 ~ Q204	Dimmer switch	Refer of circuit description on page 8.															
Q205, 206	Reqruted voltage circuit for lamp	Refer to circuit description on page 8.															
Q207	Reset switch	On for approx. 3 ms when system power is turned on ; usually OFF 															
Q208	Back-up switch	On when S201 power switch is turned on, Off when S201 power switch is turned off 															
Q209, 210	Dimmer switch control	Changed by turning Q203 and Q204 ON and OFF. <table border="1" data-bbox="1059 1128 1466 1218"><thead><tr><th>DIMMER</th><th>1</th><th>2</th><th>3</th><th>4</th></tr></thead><tbody><tr><td>Q209</td><td>ON</td><td>OFF</td><td>ON</td><td>OFF</td></tr><tr><td>Q210</td><td>ON</td><td>ON</td><td>OFF</td><td>OFF</td></tr></tbody></table>	DIMMER	1	2	3	4	Q209	ON	OFF	ON	OFF	Q210	ON	ON	OFF	OFF
DIMMER	1	2	3	4													
Q209	ON	OFF	ON	OFF													
Q210	ON	ON	OFF	OFF													
Q211	Function lamp switch	ON in FUNCTION mode															
Q212	Mic mute	ON in DTSS code and paging code output.															
Q401	Protection switch	Adjust 430MHz with VR403, and 144MHz with VR404															
D1 ~ 6,15	Variable capacitance diode tuning	144MHz band															
D7	430MHz band trasmit/receive switch	OFF in receive mode															
D9	430MHz band PLL output switch																
D10	430MHz band PLL output switch																
D11	144MHz band PLL output switch																
D12 ~ 14	Reverse current prevention																
D202	Standard voltage																
D203	Dimmer switch																
D204, 213	Reverse current prevention																
D205	Reverse current prevention, lithium battery switching	Lithium battery provides power when power is off															
D206~209	Destination setting																
D212	Microprocessor protection																
D214	Back-up detection																
D301	Power reverse connection prevention																
D302	144MHz band transmit/receive switching	MI407															
D303	144MHz band transmit/receive switching																
D304	144MHz band power detection	APC, RF meter															
D305	144MHz band reflected wave detection	Adjust with VR404, ANT short: 4A															
D401	430MHz band transmit/receive switchng	MI407															
D403	430MHz band power detection	APC, RF meter															
D404	430MHz band reflected wave detection	Adjust with VR403, ANT short : 3A															
D405	Temperature compensation	APC															

## DISCRIPTION OF COMPONENTS

### 430PLL (X58-3480-01)

Compornent	Use/Function	Operation/Condition/Compatibility
IC1	PLL	① VCO input 399.175 ~ 409.17MHz (M. M2. E. E2) 416.4 ~ 428.395MHz (K. P) in receive mode 430 ~ 439.995MHz (M. M2. E. E2) 438 ~ 449.995MHz (K. P) in transmit mode ⑩ "H" in transmit mode ⑪ "H" in transmit mode ⑬ Phase comparison output ⑭ "H" when PLL unlocked ⑫ Reference oscillation input
Q1 ~3	LPF	
Q4	Transmit switch	
Q5	VCO output amplification	399.175 ~ 409.175MHz (M. M2. E. E2), 416.4 ~ 428.395MHz (K. P) in receive mode 430 ~ 439.995MHz (M. M2. E. E2), 438 ~ 449.995MHz (K. P) in transmit mode On when operated (430MHz band)
Q101	VCO	
Q102	VCO output buffer	
Q103	VCO switch	
D1		
D101, 102	VCO voltage control	
D103	Varactor diode for modulation in Transmit mod	

### 144PLL (X58-3500-00: E. E2. M. M2), (X58-3670-11: K. P)

Compornent	Use/Function	Operation/Condition/Compatibility
IC1	PLL	① VCO input 113.7 ~ 115.7MHz (E. E2), 113.7 ~ 117.7MHz (M. M2), 127.1~131.095MHz (K. P) in reseive mode 144 ~ 145.995MHz (E. E2), 144 ~ 147.995MHz (K. P. M. M2) in transmit mode ⑩ "H" in trasmit mode ⑪ "H" in trasmit mode ⑬ Phase comparison output ⑭ "H" when PLL unlocked ⑫ Reference oscillation input
Q1,2	LPF	
Q3	Transmit switch	



# TM-702A/E

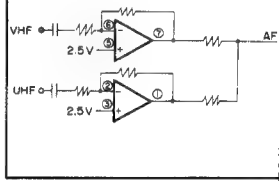
## DESCRIPTION OF COMPONENTS

Component	Use/Function	Operation/Condition/Compatibility
Q4	VCO output amplification	113.7 ~ 115.7MHz (E. E2) 113.7 ~ 117.7MHz (M. M2), 127.1~131.095MHz (K. P) in receive mode 114 ~ 145.995MHz (E. E2), 144 ~ 147.995MHz (K. P. M. M2) in transmit mode
Q101	Receive VCO	113.7 ~ 115.7MHz (E. E2) 113.7 ~ 117.7MHz (M. M2), 127.1~131.095 (K. P)
Q102	Receive VCO switch	On in receive mode
Q103	Receive VCO output buffer	113.7 ~ 115.7MHz (E. E2) 113.7 ~ 117.7MHz (M. M2), 127.1~131.095MHz (K. P)
Q104	Transmit VCO	144 ~ 145.995MHz (E. E2), 144 ~ 147.995MHz (K. P. M. M2)
Q105	Transmit VCO switch	On in transmit mode
Q106	Transmit VCO output buffer	144 ~ 145.995MHz (E. E2), 144 ~ 147.995MHz (K. P. M. M2)
D101, 102	VCO voltage control	Receive
D103	VCO voltage control/varactor diode for Modulation in transmit mode	
D104	VCO voltage control	Transmission

### MIC AMP (X59-3610-00)

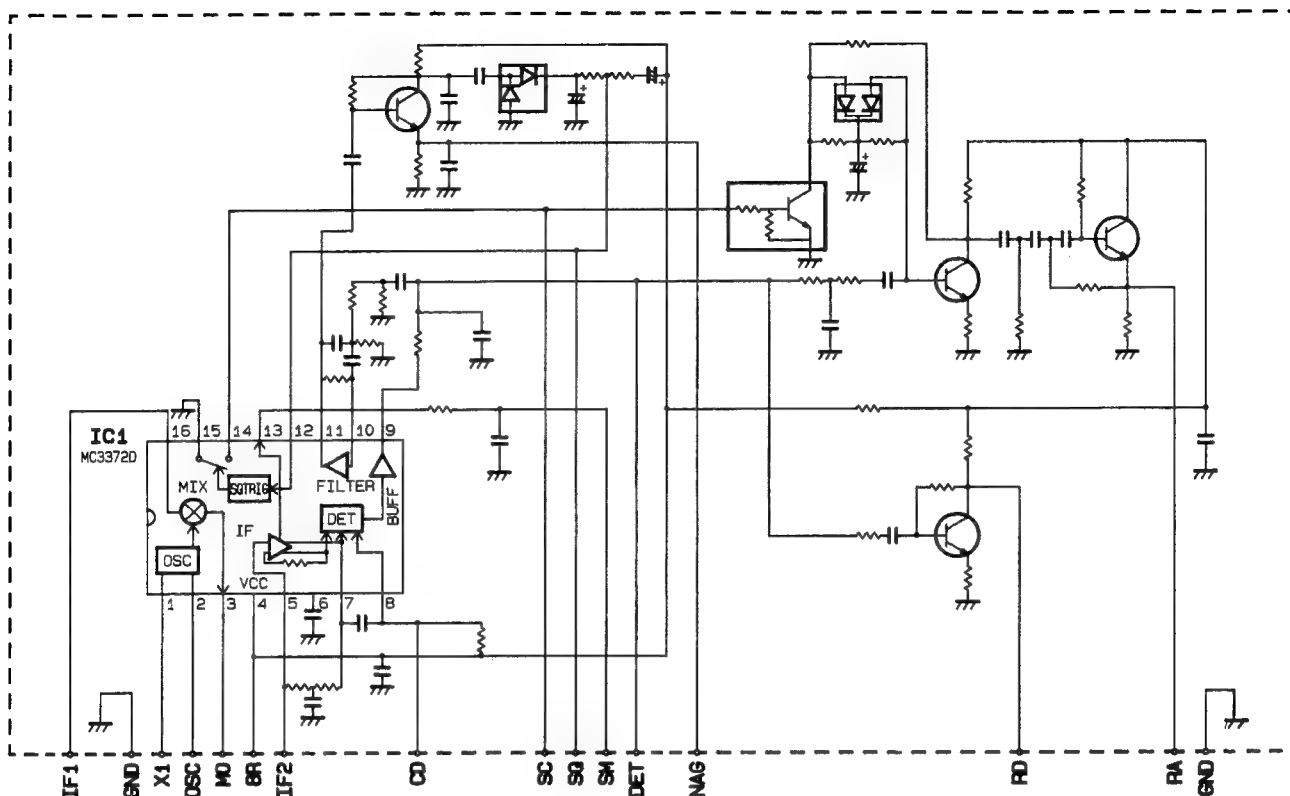
Component	Use/Function	Operation/Condition/Compatibility
IC1 (1/2)	Limited amplification	
IC1 (2/2)	LPF	
Q1	Low-frequency amplification	

### ELECTRONIC VOLUME CONTROL (X59-3800-00)

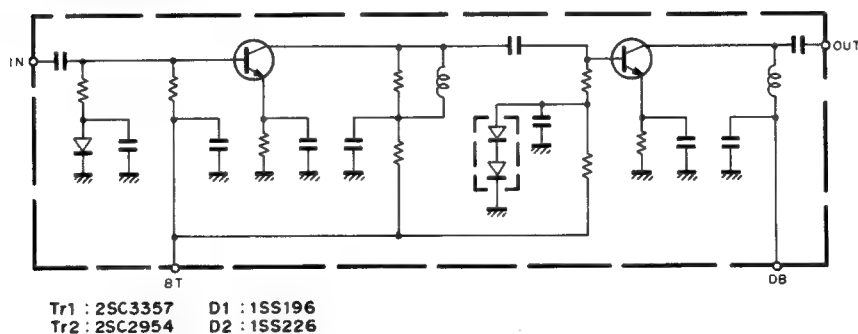
Component	Use/Function	Operation/Condition/Compatibility																																																																																					
IC1	AF preamplifier																																																																																						
IC2	Electronic VR (IC3) switching  RD line switching	<p>⑩ and ⑪ : "H" during normal operation On between ① and ⑤ and between ③ and ⑭ Off between ② and ⑤ and between ⑫ and between ⑩ ⑩ and ⑪ : "L" during remote operation with RC10 or RC20 Off between ① and ⑤ and between ③ and ⑭ On between ② and ⑤ and between ⑫ and ⑭ ③ : "L" for main VHF Off between ③ and ④. on between ④ and ⑤ On between ③ and ④. off between ④ and ⑤</p> 																																																																																					
IC3	Electronic VR	<p>② Output      ⑦ Input ⑧ Initial-pin "L" VR step 6 ⑨ "L" VR up ⑩ "L" VR down</p>																																																																																					
IC4	Shift register	<p>① ST input      ⑦ Sub-mute setting      MSB ② Data input      ⑪ Q8 : "H" : UHF mute ③ Clock input      ⑫ Q7 : NC ④ Sub-mute setting      LSB      ⑬ Q6 : NC ⑤ Sub-mute setting      ⑭ Q5 : "H" : UHF main ⑥ Sub-mute setting</p>																																																																																					
IC5	Shift register	<p>① ST input      ⑪ Q8 : "L" : Electronic VR switching remote operation ② Data input      ⑫ Q7 : "H" when electronic VR is controlled remotely ③ Clock input      ⑬ Q6 : "L" when electronic VR is up ④ Q1 : "H" when transmit power is low      ⑭ Q5 : "L" when electronic VR is down ⑤ Q2 : "H" when transmit power is medium ⑥ Q3 : "H" : VHF mute ⑦ Q4 : "L" when repeater operates</p>																																																																																					
IC6	Main/sub switching	<p>⑨⑩⑪ : "L" : Main VHF      ⑨⑩⑪ "H" : Main UHF Off between ① and ⑤      On between ① and ⑤ On between ① and ②      Off between ① and ②</p>																																																																																					
Q1 ~ 4	Sub-mute switching	<table><tr><th>Sub-mute</th><th>AU</th><th>1</th><th>2</th><th>3</th><th>4</th><th>5</th><th>6</th><th>7</th><th>8</th><th>9</th><th>10</th><th>11</th><th>12</th><th>13</th><th>14</th><th>15</th></tr><tr><td>Q1</td><td>x</td><td>○</td><td>x</td><td>○</td><td>x</td><td>○</td><td>x</td><td>○</td><td>x</td><td>○</td><td>x</td><td>○</td><td>x</td><td>○</td><td>x</td><td>○</td></tr><tr><td>Q2</td><td>x</td><td>x</td><td>○</td><td>○</td><td>x</td><td>x</td><td>○</td><td>○</td><td>x</td><td>x</td><td>○</td><td>○</td><td>x</td><td>x</td><td>○</td><td>○</td></tr><tr><td>Q3</td><td>x</td><td>x</td><td>x</td><td>x</td><td>○</td><td>○</td><td>○</td><td>○</td><td>x</td><td>x</td><td>x</td><td>x</td><td>○</td><td>○</td><td>○</td><td>○</td></tr><tr><td>Q4</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td></tr></table> <p>○ : ON    x : OFF For AU, when a signal enters the main, 15 is set automatically.</p>	Sub-mute	AU	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Q1	x	○	x	○	x	○	x	○	x	○	x	○	x	○	x	○	Q2	x	x	○	○	x	x	○	○	x	x	○	○	x	x	○	○	Q3	x	x	x	x	○	○	○	○	x	x	x	x	○	○	○	○	Q4	x	x	x	x	x	x	x	x	○	○	○	○	○	○	○	○
Sub-mute	AU	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15																																																																							
Q1	x	○	x	○	x	○	x	○	x	○	x	○	x	○	x	○																																																																							
Q2	x	x	○	○	x	x	○	○	x	x	○	○	x	x	○	○																																																																							
Q3	x	x	x	x	○	○	○	○	x	x	x	x	○	○	○	○																																																																							
Q4	x	x	x	x	x	x	x	x	○	○	○	○	○	○	○	○																																																																							
Q5	VHF mute switch	Operates when CTCSS is ON, BELL is on, and DTSS or pagins is ON : During TX, squelch ON, and VHF main Operates when squelch is ON for VHF sub																																																																																					
Q6	UHF mute switch	Operates when CTCSS is ON, BELL is ON, and DTSS or paging is ON : During TX, squelch ON, and UHF main Operates when squelch is ON for UHF sub																																																																																					

## SEMICONDUCTOR DATA

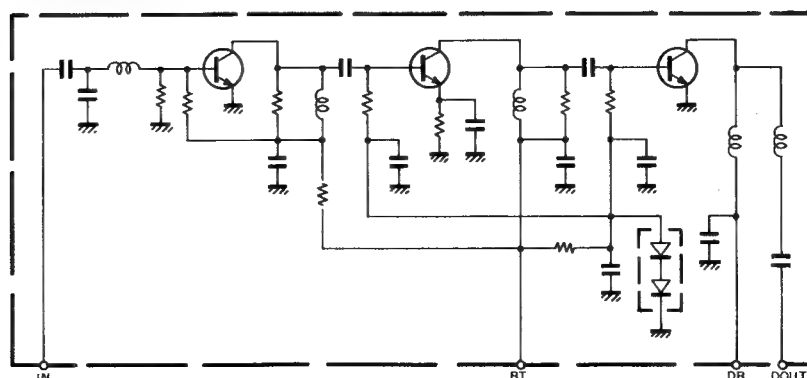
FM IF H.IC KCD04 (TX-RX UNIT IC3, 11)



H.IC KCB05 (TC-RX UNIT IC9)



H.IC KCB06 (TX-RC UNIT IC10)



# TM-702A/E

## PARTS LIST

✱ New Parts

Parts without **Parts No.** are not supplied.

Les articles non mentionnés dans le **Parts No.** ne sont pas fournis.

Telle ohne **Parts No.** werden nicht geliefert.

TM-702A/E

Ref. No. 参照番号	Address 位置	New Parts 新	Parts No. 部品番号	Description 部品名 / 規格	Desti- nation 仕向	Re- marks 備考
TM-702A/E						
1	1B	✱	A01-1067-23	METALLIC CABINET(UP SIDE)		
2	3B	✱	A01-1068-23	METALLIC CABINET(BOTTOM)		
3	2B		A10-1294-01	CHASSIS CALKED ASSY		
4	2A, 2B		A22-0770-03	SUB PANEL		
5	2A, 3A	✱	A62-0003-13	PANEL ASSY	KMM2P	
5	2A, 3A	✱	A62-0009-13	PANEL ASSY	EE2	
6	2A		B11-0484-08	FILTER(LCD ASSY)		
7	3A, 3B		B30-0869-05	LAMP		
8	2A, 3A	✱	B38-0348-05	LCD ASSY		
9	1B		B42-2455-04	LABEL(M4X8 MAX)		
			B42-3322-14	LABEL(ANT)		
			B42-3343-04	LABEL(MODEL)		
			B42-3369-04	LABEL(DC13.8V, EXT SP)		
			B42-3394-04	LABEL(FCC)	K	
			B46-0410-20	WARRANTY CARD	K	
			B46-0419-00	WARRANTY CARD	EE2	
			B46-0422-00	WARRANTY CARD	P	
		✱	B62-0002-00	INSTRUCTION MANUAL	K	
		✱	B62-0003-00	INSTRUCTION MANUAL	MM2P	
		✱	B62-0003-00	INSTRUCTION MANUAL	EE2	
		✱	B62-0004-00	INSTRUCTION MANUAL	EE2	
		✱	B72-0003-04	MODEL NAME PLATE	KP	
		✱	B72-0004-04	MODEL NAME PLATE	MM2	
		✱	B72-0005-04	MODEL NAME PLATE	EE2	
			E23-0435-05	TERMINAL(ANT)		
10	1B		E30-2105-05	ANT CABLE(M)		
11	2B		E30-2106-05	ANT CABLE(N)	EE2	
11	2B		E30-2107-05	ANT CABLE(M)	KMM2P	
			E30-2111-05	DC CORD		
12	1B	✱	E30-2137-15	DC CORD		
			E31-3346-05	CONNECTING WIRE(SP)		
			E31-6011-05	CONNECTING WIRE(6P)		
13	1B		F05-1031-05	FUSE(10A)		
			F05-2036-05	FUSE(20A)		
			F15-0670-04	SHIELDING PLATE		
16	2B		F20-0587-04	INSULATING SHEET(BATT.)		
17	2B		F20-1059-04	INSULATING SHEET(BATT.)		
18	2B		G02-0576-14	FLAT SPRING		
20	3A		G09-0405-05	KNOB FIXED SPRING		
21	1B		G10-0651-04	NON-WOVEN FABRIC(SP)		
22	1B, 3B		G10-0684-04	NON-WOVEN FABRIC(130X10)		
23	2B		G13-0639-04	CUSHION(15X6X5)		
24	2A		G13-0906-04	CUSHION(3KEY)		
25	1A		G13-0910-14	CONDUCTIVE CUSHION(UPSIDE)		
26	2B		G13-0926-04	CUSHION		
27	3B		G13-0932-04	CONDUCTIVE CUSHION(BOTTOM)		
28	2A		G13-0960-04	CUSHION(6KEY)		
29	2B		G13-0961-04	CUSHION(LOW)		
			H10-2656-02	POLYSTYRENE FOAMED FIXTURE		
			H11-0822-04	POLYSTYRENE PLATE	K	
			H11-0823-04	POLYSTYRENE PLATE	MM2P	

E: Scandinavia & Europe K: USA P: Canada W: Europe

U: PX(Far East, Hawaii) T: England M: Other Areas

UE: AAFES(Europe) X: Australia

TM-702A: K, P, M, M2  
TM-702A: E, E2

⚠ indicates safety critical components.

## PARTS LIST

× New Parts

Parts without Parts No. are not supplied.

Les articles non mentionnés dans le Parts No. ne sont pas fournis.

Telle ohne Parts No. werden nicht geliefert.

TM-702A/E

TX-RX UNIT (X57-3680-XX),(X57-3682-XX)

Ref. No. 参照番号	Address 位置	New Parts 新	Parts No. 部品番号	Description 部品名 / 規格	Desti- nation 仕 向	Re- marks 備考
			H13-0814-04 H13-0825-04 H13-0825-04 H25-0029-04 H25-0117-04	PROTECTION BOARD(BRACKET) PROTECTION BOARD PROTECTION BOARD PROTECTION BAG(MIC HOOK, SCREW) PROTECTION BAG(PC CORD)	MM2P EE2 K	
		*	H25-0720-04	PROTECTION BAG(TM-702)		
		*	H25-0750-04	PROTECTION BAG(IM)	MM2	
		*	H25-0750-04	PROTECTION BAG(IM)	EE2P	
		*	H52-0003-04	ITEM CARTON BOX	KP	
		*	H52-0004-04	ITEM CARTON BOX	MM2	
		*	H52-0005-04	ITEM CARTON BOX	EE2	
			J20-0319-24	MIC HOOK	KP	
31	1B		J21-2717-14	MOUNTING HARDWARE(SP)		
32	2A		J21-4303-08	MOUNTING HARDWARE(LCD ASSY)		
			J29-0436-03	BRACKET		
33	2A		K27-3035-14	KNOB(VFO.MR.MHz)		
34	2B		K27-3066-04	KNOB(POWER)		
35	2B		K27-3067-04	KNOB(LOW)		
37	3A		K27-3068-04	KNOB(CALL)		
38	3A		K27-3069-04	KNOB(F)		
40	3A		K27-3071-04	KNOB(TONE)		
41	3A		K27-3072-04	KNOB(REV)		
42	3A		K27-3073-04	KNOB(BAND)		
39	3A	*	K27-3074-04	KNOB(SHIFT)		
43	3A		K29-3156-04	KNOB(MAIN)		
44	3A		K29-3157-04	KNOB(VOL.SQL)		
A	1B, 3B		N09-0626-04	SCREW		
B	2B		N09-0650-05	SCREW		
C	1B, 3B		N33-2606-45	OVAL HEAD MACHINE SCREW		
			N46-3010-46	PAN HEAD TAPPING SCREW	KP	
D	2B, 3B		N87-2606-46	BRAZIER HEAD TAPTITE SCREW		
E	2B		N87-2610-46	BRAZIER HEAD TAPTITE SCREW		
F	2A, 2B		N88-2606-46	FLAT HEAD TAPTITE SCREW		
			N99-0331-05	SCREW SET		
45	1B		T07-0246-05	LOUDSPEAKER(FULLRANGE)		
			T91-0379-25	MICROPHONE	MM2	
			T91-0380-35	MICROPHONE	KP	
			T91-0382-25	MICROPHONE	EE2	
IC1			MSM5265GSK	IC(LCD DRIVER)		
IC301			M57737R	IC(POWER MODULE/ 144-148MHZ)		
IC401			M57729	IC(POWER MODULE)		
LCD1		*	SLU1684	LCD		
			W01-0414-04	WRENCH		
46	2B		W09-0326-05	LITHIUM BATTERY		
48	2A		490-0139-05	COPPER LEAF TAPE		
47	3B	*	X57-3680-11	TX-RX UNIT	KP	
47	3B	*	X57-3680-21	TX-RX UNIT	M	
47	3B	*	X57-3680-22	TX-RX UNIT	M2	
47	3B	*	X57-3682-71	TX-RX UNIT	E	
47	3B	*	X57-3682-72	TX-RX UNIT	E2	
TX-RX UNIT (TM-702A:X57-3680-XX)-11. K, P, -21:M, -22:M2, (TM-702E:X57-3682-XX) -71:E, -72:E2						
C1			CC73FCH1H040C	CHIP C 4PF C		
C4 -7			CK73FB1H102K	CHIP C 1000PF K		


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# TM-702A/E

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TM-702A/E

TX-RX UNIT (X57-3680-XX),(X57-3682-XX)

Ref. No. 参照番号	Address 位置	New Parts 新	Parts No. 部品番号	Description 部品名 / 規格	Desti- nation 仕向	Re- marks 備考
C8 C9 ,10 C11 C12 C13			CC73FCH1H0R5C CC73FCH1H680J CC73FCH1H0R5C CC73FCH1H680J CK73FB1H102K	CHIP C 0.5PF C CHIP C 68PF J CHIP C 0.5PF C CHIP C 68PF J CHIP C 1000PF K		
C14 C15 C16 -18 C21 C22 ,23			CC73FCH1H150J CC73FCH1H030C CK73FB1H102K CC73FCH1H040C CK73FB1H102K	CHIP C 15PF J CHIP C 3PF C CHIP C 1000PF K CHIP C 4PF C CHIP C 1000PF K		
C24 C25 C26 C27 C28			CK73FB1H471K CK73FB1H102K CK73FB1E223K CK73FB1H102K CC73FCH1H010C	CHIP C 470PF K CHIP C 1000PF K CHIP C 0.022UF K CHIP C 1000PF K CHIP C 1PF C		
C29 C30 C31 ,32 C33 C34			CK73FB1H471K CC73FCH1H390J CK73FB1H102K CC73FCH1HR75C CC73FCH1H390J	CHIP C 470PF K CHIP C 39PF J CHIP C 1000PF K CHIP C 0.75PF C CHIP C 39PF J		
C35 C35 C35 C36 ,37 C38			CC73FCH1H030C CC73FCH1H050C CC73FCH1H050C CK73FB1H102K CK73FB1H471K	CHIP C 3PF C CHIP C 5PF C CHIP C 5PF C CHIP C 1000PF K CHIP C 470PF K	KP MM2 EE2	
C39 C40 C41 C41 C42			CK73FB1H102K CK73FB1H103K CC73FCH1H080D CC73FCH1H100D CK73FB1H103K	CHIP C 1000PF K CHIP C 0.010UF K CHIP C 8PF D CHIP C 10PF D CHIP C 0.010UF K	MM2EE2 KP	
C43 C44 C45 C46 C47			CK73FB1H102K CK73EB1E104K CK73FB1E223K CE04EW1C470M CC73FCH1H120J	CHIP C 1000PF K CHIP C 0.10UF K CHIP C 0.022UF K ELECTRO 47UF 16WV CHIP C 12PF J	MM2EE2	
C47 C48 C49 C50 C51 -53			CC73FCH1H680J CC73FCH1H330J CK73FB1H102K C92-0504-05 CK73BF1C105Z	CHIP C 68PF J CHIP C 33PF J CHIP C 1000PF K CHIP TAN 0.68UF 20WV CHIP C 1.0UF Z	KP	
C54 C55 C56 ,57 C58 C59			CK73FB1H103K CK73FB1H102K CK73FB1H103K CC73FSL1H101J CE04EW1C100M	CHIP C 0.010UF K CHIP C 1000PF K CHIP C 0.010UF K CHIP C 100PF J ELECTRO 10UF 16WV	KP KP KP KP KP	
C60 C61 C62 C63 C65 ,66			CK73FB1E223K CK73FB1E333K C92-0004-05 CK73FB1H102K CC73FSL1H101J	CHIP C 0.022UF K CHIP C 0.033UF K CHIP TAN 1.0UF 16WV CHIP C 1000PF K CHIP C 100PF J	KP KP KP KP	
C67 -68 C69 ,70 C71 C72 C73			CK73FB1H102K CK73FB1H102K CK73FB1H103K CE04EW1A101M CK73FB1H102K	CHIP C 1000PF K CHIP C 1000PF K CHIP C 0.010UF K ELECTRO 100UF 10WV CHIP C 1000PF K		


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TM-702A/E

TX-RX UNIT (X57-3680-XX),(X57-3682-XX)

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C74			CE04EW1A221M	ELECTRØ 220UF 10WV		
C75			CK73FB1H102K	CHIP C 1000PF K		
C76			CK73FB1H103K	CHIP C 0.010UF K		
C77			CE04EW1A221M	ELECTRØ 220UF 10WV		
C78			CK73EB1E104K	CHIP C 0.10UF K		
C79			CK73FB1H102K	CHIP C 1000PF K		
C80			CE04EW1A221M	ELECTRØ 220UF 10WV		
C81			CK73FB1H102K	CHIP C 1000PF K		
C82			CK73FB1E333K	CHIP C 0.033UF K		
C83 -85			CE04EW1C470M	ELECTRØ 47UF 16WV		
C86			CQ92M1H154K	MYLAR 0.15UF K		
C87			CE04EW1A471M	ELECTRØ 470UF 10WV		
C88			CE04EW1C101M	ELECTRØ 100UF 16WV		
C89			CK73FB1H103K	CHIP C 0.010UF K		
C90			CC73FCH1H050C	CHIP C 5PF C		
C91			CK73FB1E223K	CHIP C 0.022UF K		
C92			CK73FB1H102K	CHIP C 1000PF K		
C93			CK73EF1C105Z	CHIP C 1.0UF Z		
C94			CK73FF1E104Z	CHIP C 0.1UF Z		
C95			CK73FB1H102K	CHIP C 1000PF K		
C96			CE04EW1C470M	ELECTRØ 47UF 16WV		
C97			CC73FCH1H060D	CHIP C 6PF D	KP	
C98			CK73FB1H102K	CHIP C 1000PF K		
C99			CC73FCH1H040C	CHIP C 4PF C	KP	
C99			CC73FCH1H060D	CHIP C 6PF D	MM2EE2	
C100			CK73EF1C105Z	CHIP C 1.0UF Z		
C101			CK73FB1H103K	CHIP C 0.010UF K		
C102			CC73FCH1H100D	CHIP C 10PF D		
C103			CK73FB1H102K	CHIP C 1000PF K		
C104			CC73FCH1H270J	CHIP C 27PF J		
C105			CK73EF1C105Z	CHIP C 1.0UF Z		
C106			C92-0002-05	CHIP TAN 0.22UF 35WV		
C107			C92-0504-05	CHIP TAN 0.68UF 20WV		
C108			C92-0002-05	CHIP TAN 0.22UF 35WV		
C109			C92-0504-05	CHIP TAN 0.68UF 20WV		
C110,111			CK73FB1H102K	CHIP C 1000PF K		
C112			CK73EF1C105Z	CHIP C 1.0UF Z		
C113,114			CE04EW1C100M	ELECTRØ 10UF 16WV		
C115			C92-0005-05	CHIP TAN 2.2UF 6.3WV		
C116-122			CK73FB1H102K	CHIP C 1000PF K		
C123			C90-2092-05	ELECTRØ 10UF 16WV		
C124			CK73FB1H102K	CHIP C 1000PF K		
C125,126			CK73FB1H471K	CHIP C 470PF K		
C127			CC73FCH1H120J	CHIP C 12PF J		
C128			CK73FB1H103K	CHIP C 0.010UF K		
C129			CC73FCH1H070D	CHIP C 7PF D		
C130			CK73FB1H102K	CHIP C 1000PF K		
C131			CK73FB1H103K	CHIP C 0.010UF K		
C132			CK73FB1H102K	CHIP C 1000PF K		
C133			CK73EB1E104K	CHIP C 0.10UF K		
C134			CK73FB1E223K	CHIP C 0.022UF K		
C135			CE04EW1C470M	ELECTRØ 47UF 16WV		
C136			CC73FSL1H330J	CHIP C 33PF J	KP	
C136			CC73FSL1H470J	CHIP C 47PF J	MM2	
C136			CC73FSL1H470J	CHIP C 47PF J	EE2	

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TM-702A/E

TX-RX UNIT (X57-3680-XX),(X57-3682-XX)

Ref. No. 参照番号	Address 位置	New Parts 新	Parts No. 部品番号	Description 部品名 / 規格	Desti- nation 仕向	Re- marks 備考
C137			CC73FSL1H390J	CHIP C 39PF J	MM2	
C137			CC73FSL1H390J	CHIP C 39PF J	EE2	
C137			CC73FSL1H560J	CHIP C 56PF J	KP	
C138			CK73BF1C105Z	CHIP C 1.0UF Z		
C139			C92-0504-05	CHIP TAN 0.68UF 20WV		
C140			CK73BF1C105Z	CHIP C 1.0UF Z		
C141			CK73FB1H332K	CHIP C 3300PF K		
C142-145			CK73FB1H471K	CHIP C 470PF K		
C146, 147			CC73FCH1H100D	CHIP C 10PF D		
C148, 149			CK73FB1H471K	CHIP C 470PF K		
C150, 151			CC73FCH1H070D	CHIP C 7PF D		
C153			CC73FCH1H030C	CHIP C 3PF C	MM2EE2	
C153			CC73FCH1H030C	CHIP C 3PF C	MM2EE2	
C153			CC73FCH1H040C	CHIP C 4PF C	KP	
C154, 155			CK73BF1C105Z	CHIP C 1.0UF Z		
C156			CK73FB1H102K	CHIP C 1000PF K		
C201			CK73FB1H102K	CHIP C 1000PF K		
C202			CK73FB1H103K	CHIP C 0.010UF K		
C203			CK73FB1H102K	CHIP C 1000PF K		
C204			CK73FB1H103K	CHIP C 0.010UF K		
C205			CE04NW0J221M	ELECTR0 220UF 6.3WV		
C206			CK73FB1E223K	CHIP C 0.022UF K		
C207			CK73FB1H102K	CHIP C 1000PF K		
C208, 209			CC73FCH1H330J	CHIP C 33PF J		
C210, 211			CK73FB1H103K	CHIP C 0.010UF K		
C212-214			CC73FSL1H101J	CHIP C 100PF J		
C215-217			CK73FB1H102K	CHIP C 1000PF K		
C218			CK73EB1E104K	CHIP C 0.10UF K		
C219, 220			CK73FB1H103K	CHIP C 0.010UF K		
C301-303			CK73FB1H102K	CHIP C 1000PF K		
C305, 306			CK73FB1H102K	CHIP C 1000PF K		
C307, 308			CE04EW1C100M	ELECTR0 10UF 16WV		
C309			CC45SL2H180J	CERAMIC 18PF J		
C310-312			CK73FB1H102K	CHIP C 1000PF K		
C313			CC45SL2H220J	CERAMIC 22PF J		
C314			CC73FCH1H180J	CHIP C 18PF J		
C316			CC45SL2H330J	CERAMIC 33PF J		
C317			CK73FB1H102K	CHIP C 1000PF K		
C319			CK45B2H102K	CERAMIC 1000PF K		
C320			CC45SL2H330J	CERAMIC 33PF J		
C321			CC73FCH1H020C	CHIP C 2.0PF C		
C322, 323			CK73FB1H102K	CHIP C 1000PF K		
C325			CC45SL2H220J	CERAMIC 22PF J		
C326			CC73FCH1H010C	CHIP C 1PF C		
C401			CK73FB1H471K	CHIP C 470PF K		
C402			CE04CW1C100M	ELECTR0 10UF 16WV		
C403			CK73FB1H471K	CHIP C 470PF K		
C404			CE04CW1C100M	ELECTR0 10UF 16WV		
C405			CK73FB1H471K	CHIP C 470PF K		
C406			CM73F2H080D	CHIP C 8.0PF D	KP	
C406			CM73F2H090D	CHIP C 9.0PF D	MM2	
C406			CM73F2H090D	CHIP C 9.0PF D	EE2	
C407, 408			CK73FB1H471K	CHIP C 470PF K		
C409			CC73FCH1H050C	CHIP C 5PF C		
C410			CC45SL2H030C	CERAMIC 3.0PF C		


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TM-702A/E

TX-RX UNIT (X57-3680-XX),(X57-3682-XX)

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C411 C412 C413 C415,416 C417			CC73FCH1H010C CM73F2H140J CM73F2H100D CK73FB1H471K CK45B2H102K	CHIP C 1PF C CHIP C 14PF J CHIP C 10PF D CHIP C 470PF K CERAMIC 1000PF K		
C422 C423 C424 C425 C426,427			CM73F2H020C CK73FB1H102K C92-0507-05 CK73FB1H102K CK73FB1H472K	CHIP C 2.0PF C CHIP C 1000PF K CHIP TAN 4.7UF 6.3WV CHIP C 1000PF K CHIP C 4700PF K		
C428-430 C431 C432-435 C436 TC1 ,2 TC3			CK73FB1H102K CK73FB1H471K CK73FB1H102K C92-0507-05 C05-0346-05  C05-0345-05	CHIP C 1000PF K CHIP C 470PF K CHIP C 1000PF K CHIP TAN 4.7UF 6.3WV TRIM CAP  TRIMMING CAP (10P)		
CN1 CN2 ,3 CN4 CN5 ,6 CN7			E04-0154-05 E40-5209-05 E04-0154-05 E40-5202-05 E40-5183-05	RF COAXIAL CABLE RECEPTACLE PIN CONNECTOR(6P) RF COAXIAL CABLE RECEPTACLE PIN CONNECTOR(13P) PIN CONNECTOR(6P)		
CN201,202 CN203 CN204 CN205 CN301			E40-5203-05 E40-5185-05 E40-5187-05 E40-5341-05 E40-3249-05	PIN CONNECTOR(13P) PIN CONNECTOR(8P) PIN CONNECTOR(10P) PIN CONNECTOR(9P) PIN CONNECTOR(5P)		
CN302 CN303 CN401 CN402,403 CN404			E40-3246-05 E40-3483-05 E40-0274-05 E40-5208-05 E40-5210-05	PIN CONNECTOR(2P) PIN CONNECTOR(4P) PIN CONNECTOR(2P) PIN CONNECTOR(6P) PIN CONNECTOR(4P)		
J201 J401 TP1 TP2 ,3 TP301		*	E06-0860-05 E11-0425-05 E40-0211-05 E23-0464-05 E23-0465-05	CYLINDRICAL RECEPTACLE PHONE JACK PIN CONNECTOR(2P) TERMINAL TERMINAL		
TP401,402 W1 W2 W201 W202			E23-0465-05 E31-6009-05 E31-6010-05 E31-6003-15 E33-1871-15	TERMINAL CONNECTING WIRE(2P) CONNECTING WIRE(5P) CONNECTING WIRE(CTCSS) FINISHED WIRE SET	KP	
W202 W301 W401 W402		*	E33-1871-15 E31-3350-05 E31-2066-05 E31-6013-05	FINISHED WIRE SET CONNECTING WIRE(FB) CONNECTING WIRE(D0) CONNECTING WIRE(RA)	MM2E	
			J30-0545-05 J31-0534-05	SPACER COLLAR		
CD1 ,2 CF1 ,2 L1 -4 L5 L5 L5			L79-1013-05 L72-0372-05 L34-4080-05 L34-0956-05 L34-4260-05	DISCRI CERAMIC FILTER COIL COIL COIL	KP MM2	
		*	L34-4260-05	COIL	EE2	

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L6			L40-1872-80	SMALL FIXED INDUCTOR(18NH)		
L7			L40-1272-48	SMALL FIXED INDUCTOR(12NH)		
L8 ,9			L79-0690-05	HELICAL BLOCK		
L10 ,11			L40-1872-48	SMALL FIXED INDUCTOR(18NH)		
L12			L30-0508-05	COIL	KP	
L12			L34-2157-05	TUNING COIL	MM2	
L12			L34-2157-05	TUNING COIL	EE2	
L13			L40-2772-48	SMALL FIXED INDUCTOR(27NH)	KP	
L13			L40-3972-48	SMALL FIXED INDUCTOR(39NH)	MM2	
L13			L40-3972-48	SMALL FIXED INDUCTOR(39NH)	EE2	
L14			L40-1092-81	SMALL FIXED INDUCTOR(1UH)	MM2	
L14			L40-1092-81	SMALL FIXED INDUCTOR(1UH)	EE2	
L15			L40-2272-48	SMALL FIXED INDUCTOR(22NH)		
L16			L40-6872-80	SMALL FIXED INDUCTOR(68NH)		
L17			L34-2157-05	COIL	MM2	
L17			L34-2157-05	COIL	EE2	
L17			L34-4105-05	COIL	KP	
L18			L40-1092-81	SMALL FIXED INDUCTOR(1UH)	MM2	
L18			L40-1092-81	SMALL FIXED INDUCTOR(1UH)	EE2	
L19			L40-4782-48	SMALL FIXED INDUCTOR(0.47UH)		
L20 -24			L40-1092-48	SMALL FIXED INDUCTOR(1UH)		
L25			L40-3372-80	SMALL FIXED INDUCTOR(33NH)		
L26			L40-2272-48	SMALL FIXED INDUCTOR(22NH)		
L302			L34-1260-05	COIL (10.5T)		
L303			L34-0895-05	COIL (6T)		
L304,305			L34-0742-05	COIL (5T)		
L306			L34-1260-05	COIL (10.5T)		
L307			L34-0499-05	COIL (4T)		
L401			L34-1239-05	COIL (10.5T)		
L402			L34-1185-05	COIL (2.5T)		
L403			L34-1040-05	COIL (1T)		
L404			L34-1226-05	COIL (1.5T)		
X1			L77-1253-05	CRYSTAL RESONATOR(21.145MHz)	KP	
X1			L77-1356-05	CRYSTAL RESONATOR(30.37MHz)	MM2	
X1			L77-1356-05	CRYSTAL RESONATOR(30.37MHz)	EE2	
X2			L77-1405-05	CRYSTAL RESONATOR(12.8MHz)		
X3			L77-1357-05	CRYSTAL RESONATOR(17.355MHz)	KP	
X3			L77-1444-05	CRYSTAL RESONATOR(29.845MHz)	MM2	
X3			L77-1444-05	CRYSTAL RESONATOR(29.845MHz)	EE2	
X201			L77-1397-05	CRYSTAL RESONATOR(4.19MHz)		
XF1			L71-0252-05	CRYSTAL FILTER(21.6MHz)	KP	
XF1			L71-0263-05	CRYSTAL FILTER(30.825MHz)	MM2	
XF1			L71-0263-05	CRYSTAL FILTER(30.825MHz)	EE2	
XF2			L71-0276-05	CRYSTAL FILTER(16.9MHz)	KP	
XF2			L71-0294-05	CRYSTAL FILTER(30.3MHz)	MM2	
XF2			L71-0294-05	CRYSTAL FILTER(30.3MHz)	EE2	
R1			RK73FB2A103J	CHIP R 10K J 1/10W		
R2			RK73FB2A223J	CHIP R 22K J 1/10W		
R3			RK73FB2A101J	CHIP R 100 J 1/10W		
R4			RK73FB2A274J	CHIP R 270K J 1/10W		
R5 -8			RK73FB2A103J	CHIP R 10K J 1/10W		
R9			RK73FB2A101J	CHIP R 100 J 1/10W		
R10 ,11			R92-0670-05	CHIP R 0 OHM		
R12			RK73FB2A273J	CHIP R 27K J 1/10W	KP	

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R13			RK73FB2A473J	CHIP R 47K J 1/10W		
R14			RK73FB2A273J	CHIP R 27K J 1/10W		
R15			RK73FB2A104J	CHIP R 100K J 1/10W		
R16			RK73FB2A473J	CHIP R 47K J 1/10W		
R17			RK73FB2A274J	CHIP R 270K J 1/10W		
R18			RK73FB2A470J	CHIP R 47 J 1/10W	KP MM2EE2	
R19			RK73FB2A220J	CHIP R 22 J 1/10W		
R19			RK73FB2A470J	CHIP R 47 J 1/10W		
R20			RK73FB2A104J	CHIP R 100K J 1/10W		
R21 ,22			R92-0670-05	CHIP R 0 OHM		
R23			RK73FB2A222J	CHIP R 2.2K J 1/10W		
R24			RK73FB2A104J	CHIP R 100K J 1/10W		
R25			RK73FB2A333J	CHIP R 33K J 1/10W		
R26 ,27			RK73FB2A101J	CHIP R 100 J 1/10W		
R28			RK73FB2A470J	CHIP R 47 J 1/10W		
R29			RK73FB2A270J	CHIP R 27 J 1/10W		
R30			RK73FB2A471J	CHIP R 470 J 1/10W		
R31 ,32			RK73FB2A102J	CHIP R 1.0K J 1/10W		
R33			RK73FB2A223J	CHIP R 22K J 1/10W		
R34			RK73FB2A102J	CHIP R 1.0K J 1/10W		
R35			RK73FB2A221J	CHIP R 220 J 1/10W		
R37			R92-0670-05	CHIP R 0 OHM		
R38			R92-0670-05	CHIP R 0 OHM		
R39			R92-0670-05	CHIP R 0 OHM		
R40			RK73FB2A222J	CHIP R 2.2K J 1/10W		
R41			RK73FB2A101J	CHIP R 100 J 1/10W		
R42			RK73FB2A122J	CHIP R 1.2K J 1/10W		
R43			RK73FB2A181J	CHIP R 180 J 1/10W		
R44			RK73FB2A334J	CHIP R 330K J 1/10W		
R45			RK73FB2A102J	CHIP R 1.0K J 1/10W		
R46			RK73FB2A224J	CHIP R 220K J 1/10W		
R47			RK73FB2A473J	CHIP R 47K J 1/10W		
R48			RK73FB2A103J	CHIP R 10K J 1/10W		
R49			RK73FB2A474J	CHIP R 470K J 1/10W		
R50			RK73FB2A332J	CHIP R 3.3K J 1/10W	KP	
R51			RK73FB2A274J	CHIP R 270K J 1/10W	KP	
R52			RK73FB2A102J	CHIP R 1.0K J 1/10W	KP	
R53			RK73FB2A104J	CHIP R 100K J 1/10W		
R54			RK73FB2A681J	CHIP R 680 J 1/10W	KP	
R55			RK73FB2A272J	CHIP R 2.7K J 1/10W	KP	
R56			RK73FB2A102J	CHIP R 1.0K J 1/10W		
R57 ,58			RK73FB2A473J	CHIP R 47K J 1/10W		
R59			RK73FB2A103J	CHIP R 10K J 1/10W		
R60			RK73FB2A102J	CHIP R 1.0K J 1/10W		
R61			RK73FB2A272J	CHIP R 2.7K J 1/10W	KPMM2	
R61			R92-0670-05	CHIP R 0 OHM	E	
R62			RK73FB2A472J	CHIP R 4.7K J 1/10W	KPMM2	
R62			RK73FB2A682J	CHIP R 6.8K J 1/10W	E	
R63			R92-0670-05	CHIP R 0 OHM		
R64			RK73FB2A223J	CHIP R 22K J 1/10W		
R65			R92-0670-05	CHIP R 0 OHM		
R66			RK73FB2A683J	CHIP R 68K J 1/10W		
R67			RK73FB2A103J	CHIP R 10K J 1/10W		
R68			RK73FB2A154J	CHIP R 150K J 1/10W		
R69			RK73FB2A223J	CHIP R 22K J 1/10W		

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# TM-702A/E

## PARTS LIST

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TM-702A/E

TX-RX UNIT (X57-3680-XX),(X57-3682-XX)

Ref. No. 参照番号	Address 位置	New Parts 新	Parts No. 部品番号	Description 部品名 / 規格	Desti- nation 仕 向	Re- marks 備考
R70			R92-0670-05	CHIP R 0 ΩHM		
R71			RK73FB2A103J	CHIP R 10K J 1/10W		
R72			R92-1215-05	CHIP R 470 J 1/2W		
R73			RK73FB2A103J	CHIP R 10K J 1/10W		
R74			RK73FB2A122J	CHIP R 1.2K J 1/10W		
R75 ,76			RK73FB2A101J	CHIP R 100 J 1/10W		
R77			RK73FB2A473J	CHIP R 47K J 1/10W		
R78			RK73FB2A471J	CHIP R 470 J 1/10W		
R79			RK73FB2A470J	CHIP R 47 J 1/10W		
R80			RK73FB2A471J	CHIP R 470 J 1/10W		
R81			RK73FB2A103J	CHIP R 10K J 1/10W		
R82 ,83			RK73FB2A222J	CHIP R 2.2K J 1/10W		
R84			RK73FB2A105J	CHIP R 1.0M J 1/10W		
R85			RK73FB2A471J	CHIP R 470 J 1/10W		
R86			RK73FB2A104J	CHIP R 100K J 1/10W		
R87			RK73FB2A470J	CHIP R 47 J 1/10W		
R88			RK73FB2A103J	CHIP R 10K J 1/10W		
R89			RK73FB2A562J	CHIP R 5.6K J 1/10W		
R90			RK73FB2A331J	CHIP R 330 J 1/10W		
R91			R92-1217-05	CHIP R 0		
R92			RK73FB2A223J	CHIP R 22K J 1/10W		
R93 ,94			RK73FB2A473J	CHIP R 47K J 1/10W		
R95			RK73FB2A103J	CHIP R 10K J 1/10W		
R96			RK73FB2A182J	CHIP R 1.8K J 1/10W		
R97			R92-0670-05	CHIP R 0 ΩHM		
R98			RK73FB2A223J	CHIP R 22K J 1/10W		
R99 ,100			RK73FB2A473J	CHIP R 47K J 1/10W		
R101			RK73FB2A103J	CHIP R 10K J 1/10W		
R102			RK73FB2A182J	CHIP R 1.8K J 1/10W		
R103			R92-0679-05	CHIP R 0 ΩHM		
R104			RK73FB2A102J	CHIP R 1.0K J 1/10W		
R105			R92-0685-05	CHIP R 22 J 1/2W		
R106			RK73FB2A102J	CHIP R 1.0K J 1/10W		
R107,108			RK73FB2A472J	CHIP R 4.7K J 1/10W		
R109			R92-0670-05	CHIP R 0 ΩHM		
R110			RK73FB2A273J	CHIP R 27K J 1/10W		
R111			RK73FB2A333J	CHIP R 33K J 1/10W		
R112-114			RK73FB2A223J	CHIP R 22K J 1/10W		
R115			RK73FB2A103J	CHIP R 10K J 1/10W		
R116			RK73FB2A471J	CHIP R 470 J 1/10W		
R117			RK73FB2A470J	CHIP R 47 J 1/10W		
R118,119			RK73FB2A473J	CHIP R 47K J 1/10W		
R120			RK73FB2A821J	CHIP R 820 J 1/10W		
R121			RK73FB2A5R6J	CHIP R 5.6 J 1/10W		
R122			RK73FB2A821J	CHIP R 820 J 1/10W		
R123			RK73FB2A473J	CHIP R 47K J 1/10W		
R124			RK73FB2A223J	CHIP R 22K J 1/10W		
R125			RK73FB2A471J	CHIP R 470 J 1/10W		
R126			RK73FB2A120J	CHIP R 12 2 A		
R127			RK73FB2A101J	CHIP R 100 J 1/10W		
R128			RK73FB2A222J	CHIP R 2.2K J 1/10W		
R129			R92-0670-05	CHIP R 0 ΩHM		
R129,130			RK73FB2A182J	CHIP R 1.8K J 1/10W		MM2EB2
R130			RK73FB2A102J	CHIP R 1.0K J 1/10W		KP
R131			RK73FB2A473J	CHIP R 47K J 1/10W		MM2EB2


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## PARTS LIST

× New Parts

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TM-702A/E


TX-RX UNIT (X57-3680-XX),(X57-3682-XX)

Ref. No. 参照番号	Address 位置	New Parts 新	Parts No. 部品番号	Description 部品名 / 規格	Desti- nation 仕向	Re- marks 備考
R132,133			RK73FB2A103J	CHIP R 10K J 1/10W		
R134			RK73FB2A471J	CHIP R 470 J 1/10W		
R135			RK73FB2A334J	CHIP R 330K J 1/10W		
R137			RK73FB2A224J	CHIP R 220K J 1/10W		
R138			RK73FB2A473J	CHIP R 47K J 1/10W		
R139			RK73FB2A181J	CHIP R 180 J 1/10W		
R140,141			R92-0670-05	CHIP R 0 ΩHM		
R142,143			RK73FB2A101J	CHIP R 100 J 1/10W		
R145			RK73FB2A273J	CHIP R 27K J 1/10W		
R146,147			RK73FB2A474J	CHIP R 470K J 1/10W		
R148			RK73FB2A101J	CHIP R 100 J 1/10W		
R201			RK73EB2B180J	CHIP R 18 J 1/8W		
R202			R92-0685-05	CHIP R 22 J 1/2W		
R203			R92-1259-05	FIXED RESISTOR		
R204			R92-1262-05	FIXED RESISTOR		
R205			RK73FB2A472J	CHIP R 4.7K J 1/10W		
R206			RK73EB2B220J	CHIP R 22 J 1/8W		
R207			RK73FB2A103J	CHIP R 10K J 1/10W		
R208			RK73FB2A471J	CHIP R 470 J 1/10W		
R209			RK73FB2A561J	CHIP R 560 J 1/10W		
R210			RK73FB2A563J	CHIP R 56K J 1/10W		
R211			RK73FB2A103J	CHIP R 10K J 1/10W		
R213			RK73FB2A472J	CHIP R 4.7K J 1/10W		
R214			RK73FB2A474J	CHIP R 470K J 1/10W		
R215			R92-0670-05	CHIP R 0 ΩHM		
R216,217			RK73FB2A472J	CHIP R 4.7K J 1/10W		
R218			RK73FB2A105J	CHIP R 1.0M J 1/10W		
R219			R92-0670-05	CHIP R 0 ΩHM		
R222			RK73FB2A473J	CHIP R 47K J 1/10W		
R223-225			RK73FB2A473J	CHIP R 47K J 1/10W		
R226-229			RK73FB2A102J	CHIP R 1.0K J 1/10W		
R230			RK73FB2A473J	CHIP R 47K J 1/10W		
R231-234			RK73FB2A104J	CHIP R 100K J 1/10W		
R233			R92-0670-05	CHIP R 0 ΩHM		
R235			RK73FB2A474J	CHIP R 470K J 1/10W		
R236,237			RK73FB2A102J	CHIP R 1.0K J 1/10W		
R238			RK73FB2A474J	CHIP R 470K J 1/10W		
R239			RK73FB2A473J	CHIP R 47K J 1/10W		
R240			R92-0670-05	CHIP R 0 ΩHM		
R241			RK73FB2A472J	CHIP R 4.7K J 1/10W		
R242			RK73FB2A104J	CHIP R 100K J 1/10W		
R243			RK73FB2A474J	CHIP R 470K J 1/10W		
R244			RK73FB2A102J	CHIP R 1.0K J 1/10W		
R245			RK73FB2A152J	CHIP R 1.5K J 1/10W		
R301			R92-1214-05	CHIP R 120 J 1/2W		
R302			RK73FB2A223J	CHIP R 22K J 1/10W		
R303			RK73FB2A220J	CHIP R 22 J 1/10W		
R304			RK73FB2A103J	CHIP R 10K J 1/10W		
R402,403			R92-0670-05	CHIP R 0 ΩHM		
R404			R92-1214-05	CHIP R 120 J 1/2W		
R405			RK73FB2A103J	CHIP R 10K J 1/10W		
R406			RK73FB2A470J	CHIP R 47 J 1/10W		
R407			RK73FB2A103J	CHIP R 10K J 1/10W		
R408			R92-0679-05	CHIP R 0 ΩHM		
R409			RK73FB2A270J	CHIP R 27 J 1/10W		

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# TM-702A/E

## PARTS LIST

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TM-702A/E

TX-RX UNIT (X57-3680-XX),(X57-3682-XX)

Ref. No. 参照番号	Address 位置	New Parts 新	Parts No. 部品番号	Description 部品名 / 規格	Desti- nation 仕向	Re- marks 備考
R410			R92-0150-05	JUMPER RES 0 OHM		
VR1			R12-6431-05	TRIM POT. 220K		
VR2 ,3			R12-6452-05	TRIMMING POT.100K		
VR4 ,5			R12-6427-05	TRIM POT. 47K		
VR7			R12-6452-05	TRIMMING POT.100K		
VR8			R12-6427-05	TRIM POT. 47K		
VR201			R05-3441-05	POTENTIOMETER10KA		
VR202			R05-4420-05	POTENTIOMETER50KB		
VR401			R12-6450-05	TRIMMING POT.47K		
VR402-404			R12-6427-05	TRIM POT. 47K		
S201			S40-2458-05	PUSH SWITCH		
S202-211			S40-1086-05	TAKT SWITCH		
D1 -4			1SV164	DIODE	KP MM2EE2	
D5			1SV164	DIODE		
D5			1SV166	DIODE		
D6			1SV166	DIODE		
D7			HSK277	DIODE		
D9 ,10			1SV128	DIODE		
D11			1SS268	DIODE		
D12 -14			1SS184	DIODE	KPME MM2EE2	
D15			1SV164	DIODE		
D202			02CZ9.1(Y)	ZENER DIODE		
D203			1SS184	DIODE		
D204			1SS181	DIODE		
D205			1SS184	DIODE		
D206			1SS184	DIODE		
D207			1SS184	DIODE	MM2 KP MM2 EE2	
D208			1SS184	DIODE		
D208			1SS184	DIODE		
D209			MA141A	DIODE		
D209			MA141A	DIODE		
D212			1SS226	DIODE		
D213			LF801	DIODE	KP	
D214			02CZ5.1(X)	ZENER DIODE		
D215			02CZ3.0(Z)	ZENER DIODE		
D216			B30-0852-05	LED		
D301			DSA3A1	DIODE		
D302			MI407	DIODE		
D303			MI308	DIODE		
D304			1SS101	DIODE	H.IC	
D305			1SS184	DIODE		
D401			MI407	DIODE		
D402			MI308	DIODE		
D403			1SS101	DIODE		
D404			MA716	DIODE		
D405			1SS184	DIODE		
IC3			KCD04	H.IC	KP	
IC4			TA7787AF	IC(FM/AM 1F/3V)		
IC5			KCC03	H.IC		
IC6			UPC78M08H	IC(VOLTAGE REGULATOR/ +8V)		
IC7			LA5010M	IC(LOW SATURATION REGULATOR)		
IC8			UPC1241H	IC		
IC9			KCB05	H.IC		
IC10			KCB06	H.IC		


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TM-702A/E

TX-RX UNIT (X57-3680-XX),(X57-3682-XX)

Ref. No. 参照番号	Address 位置	New Parts 新	Parts No. 部品番号	Description 部品名 / 規格	Desti- nation 仕 向	Re- marks 備考
IC11			KCD04	H.IC		
IC12			BU4053BF	H.IC		
IC201		*	75116GF-667-3BE	IC(MICROPROCESSOR)		
IC202			NJM78L06UA	IC(VOLTAGE REGULATOR/ +6V)		
IC203			R90-0711-05	CHIP R NETWORK		
Q1			3SK184(S)	FET		
Q2			3SK131(V12)	FET		
Q3			DTC114EK	DIGITAL TRANSISTOR	KP	
Q4			DTC114EK	DIGITAL TRANSISTOR		
Q5			3SK184(S)	FET		
Q6			2SK582	FET		
Q7			3SK184(S)	FET		
Q8			DTC114EK	DIGITAL TRANSISTOR		
Q12			2SC2714(Y)	TRANSISTOR		
Q14			2SC2712(Y)	TRANSISTOR	KP	
Q15			DTC114EK	DIGITAL TRANSISTOR	KP	
Q16			2SK208(Y)	FET	KP	
Q17			2SC2712(Y)	TRANSISTOR		
Q18			2SB1302S	TRANSISTOR		
Q19			2SC2712(Y)	TRANSISTOR		
Q20 ,21			2SC2714(Y)	TRANSISTOR		
Q22			DTC114EK	DIGITAL TRANSISTOR		
Q23			2SK208(Y)	FET		
Q24			2SC2714(Y)	TRANSISTOR		
Q25			DTC114EK	DIGITAL TRANSISTOR		
Q26			2SC2712(Y)	TRANSISTOR		
Q27			DTC114EK	DIGITAL TRANSISTOR		
Q28			2SB1119S	TRANSISTOR		
Q29			2SC2712(Y)	TRANSISTOR		
Q30			DTC114EK	DIGITAL TRANSISTOR		
Q31			2SB1119S	TRANSISTOR		
Q32			DTC114EK	DIGITAL TRANSISTOR		
Q33			DTC114EK	DIGITAL TRANSISTOR		
Q34			2SA1162(Y)	TRANSISTOR		
Q35			2SC2712(Y)	TRANSISTOR		
Q36			2SA1307(Y)	TRANSISTOR		
Q37			2SD1757K	TRANSISTOR		
Q38			2SC2714(Y)	TRANSISTOR		
Q39 ,40			2SJ144(GR)	FET		
Q201-204			2SA1519	TRANSISTOR		
Q205			2SD1682(R,S)	TRANSISTOR		
Q206-208			2SC2712(Y)	TRANSISTOR		
Q209,210			DTC114EK	DIGITAL TRANSISTOR		
Q211			DTD143EK	DIGITAL TRANSISTOR		
Q212			DTC114EK	DIGITAL TRANSISTOR		
Q401			FMW1	TRANSISTOR		
TH2			112-202-2	DIGITAL THERMISTOR(2K)		
S212			W02-0388-05	ENCODER		
			X58-3480-01	SUB UNIT (430 PLL)		
			X58-3500-00	SUB UNIT (144 PLL)	M1M2E1	
			X58-3500-00	SUB UNIT (144 PLL)	E2	
		*	X58-3670-11	SUB UNIT (144 PLL)	KP	
			X59-3610-00	MODULE UNIT (MIC AMP)		

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TX-RX UNIT (X57-3680-XX),(X57-3682-XX)

430 PLL UNIT (X58-3480-01)

Ref. No. 参照番号	Address 位置	New Parts 新	Parts No. 部品番号	Description 部品名 / 規格	Desti- nation 仕向	Re- marks 備考
			X59-3800-00	MODULE UNIT (ELE VOL)		
430 PLL UNIT (X58-3480-01)						
C1			CC73FCH1H120J	CHIP C 12PF J		
C2			CK73FB1H223K	CHIP C 0.022UF K		
C3			CC73FUJ1H220J	CHIP C 22PF J		
C4			CC73FCH1H150J	CHIP C 15PF J		
			CK73FB1H102K	CHIP C 1000PF K		
C5			CK73EB1H683K	CHIP C 0.068UF K		
C6 ,7			CK73FB1H223K	CHIP C 0.022UF K		
C8 ,9			C92-0007-05	CHIP TAN 2.2UF 20WV		
C10			C92-0002-05	CHIP TAN 0.22UF 35WV		
C11			CK73FB1H223K	CHIP C 0.022UF K		
C12			CC73FCH1H100D	CHIP C 10PF D		
C13			CK73FB1H223K	CHIP C 0.022UF K		
C14			CC73FCH1H040C	CHIP C 4PF C		
C15			CK73FB1H102K	CHIP C 1000PF K		
C16 ,17			CC73FSL1H101J	CHIP C 100PF J		
C101			CK73FB1H102K	CHIP C 1000PF K		
C102			CK73FB1H471K	CHIP C 470PF K		
C103			CC73FCH1H470J	CHIP C 47PF J		
C104			CC73FCH1H120J	CHIP C 12PF J		
C105			CC73FCH1H080D	CHIP C 8PF D		
C106,107			CC73FCH1HR75C	CHIP C 0.75PF C		
C108			CC73FCH1H0R5C	CHIP C 0.5PF C		
C109			CC73FCH1H090D	CHIP C 9PF D		
C110			CC73FCH1H080D	CHIP C 8PF D		
C111			CC73FCH1H0R5C	CHIP C 0.5PF C		
C112			CC73FCH1H040C	CHIP C 4PF C		
C113-115			CK73FB1H102K	CHIP C 1000PF K		
CN1			E40-5201-05	PIN CONNECTOR		
CN101			E40-0411-05	PIN CONNECTOR		
CN102			E40-0311-05	PIN CONNECTOR		
			F11-1122-14	SHIELDING COVER		
L1			L40-3972-80	SMALL FIXED INDUCTOR(39NH)		
L101,102			L40-8282-19	SMALL FIXED INDUCTOR(0.82UH)		
L103			L34-2333-05	COIL		
L104			L40-5682-19	SMALL FIXED INDUCTOR(0.56UH)		
L105			L40-3382-19	SMALL FIXED INDUCTOR(0.33UH)		
L106			L40-3972-80	SMALL FIXED INDUCTOR(39NH)		
R1 ,2			RK73FB2A473J	CHIP R 47K J 1/10W		
R3			RK73FB2A392J	CHIP R 3.9K J 1/10W		
R4			RK73FB2A332J	CHIP R 3.3K J 1/10W		
R5			RK73FB2A221J	CHIP R 220 J 1/10W		
R6			RK73FB2A222J	CHIP R 2.2K J 1/10W		
R7			RK73FB2A474J	CHIP R 470K J 1/10W		
R8			RK73FB2A682J	CHIP R 6.8K J 1/10W		
R9			RK73FB2A822J	CHIP R 8.2K J 1/10W		
R10 -13			RK73FB2A473J	CHIP R 47K J 1/10W		
R14			RK73FB2A331J	CHIP R 330 J 1/10W		
R15			RK73FB2A472J	CHIP R 4.7K J 1/10W		
R16			RK73FB2A222J	CHIP R 2.2K J 1/10W		
R18 ,19			RK73FB2A103J	CHIP R 10K J 1/10W		

E: Scandinavia & Europe K: USA P: Canada W: Europe

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UE: AAFES(Europe) X: Australia

TM-702A: K,P,M,M2

TM-702E: E,E2

△ indicates safety critical components.

## PARTS LIST

\* New Parts

Parts without Parts No. are not supplied.

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Teile ohne Parts No. werden nicht geliefert.

430 PLL UNIT (X58-3480-01)

144 PLL UNIT (X58-3500-00)

Ref. No. 参照番号	Address 位置	New Parts 新	Parts No. 部品番号	Description 部品名 / 規格	Desti- nation 仕 向	Re- marks 備考
R101			R92-0670-05	CHIP R 0 0HM		
R102			RK73FB2A102J	CHIP R 1.0K J 1/10W		
R103			RK73FB2A683J	CHIP R 68K J 1/10W		
R104			RK73FB2A470J	CHIP R 47 J 1/10W		
R105			RK73FB2A560J	CHIP R 56 J 1/10W		
R107			RK73FB2A470J	CHIP R 47 J 1/10W		
R108			RK73FB2A392J	CHIP R 3.9K J 1/10W		
R109			RK73FB2A103J	CHIP R 10K J 1/10W		
R110			RK73FB2A101J	CHIP R 100 J 1/10W		
R111			RK73FB2A103J	CHIP R 10K J 1/10W		
D1			1SS184	DIODE		
D101, 102			1T33C			
D103			1SV164	DIODE		
IC1			M54959FP	IC(FREQ SYNTHESIZER PLL)		
Q1 -3			2SC3324(B)	TRANSISTOR		
Q4			DTC144EK	DIGITAL TRANSISTOR		
Q5			2SC2714(Y)	TRANSISTOR		
Q101			2SK582	FET		
Q102			2SC3120	TRANSISTOR		
Q103			2SC3324(G)	TRANSISTOR		
144 PLL UNIT (X58-3500-00) M, M2, E, E2						
C1			CK73FB1E223K	CHIP C 0.022UF K		
C2 ,3			CK73FB1H102K	CHIP C 1000PF K		
C4			CK73FB1E223K	CHIP C 0.022UF K		
C5			CK73FB1H471K	CHIP C 470PF K		
C6 ,7			C92-0507-05	CHIP TAN 4.7UF 6.3WV		
C8			C92-0003-05	CHIP TAN 0.47UF 25WV		
C9			CK73EB1E473K	CHIP C 0.047UF K		
C10			CC73FCH1H050C	CHIP C 5PF C		
C11 ,12			CK73FB1H102K	CHIP C 1000PF K		
C13 ,14			CK73FB1E223K	CHIP C 0.022UF K		
CN1			E40-5201-05	PIN CONNECTOR(7P)		
CN101			E40-0411-05	PIN CONNECTOR(4P)		
CN102			E40-0311-05	PIN CONNECTOR(3P)		
			F11-1122-14	SHIELDING COVER		
L1			L40-3391-19	SMALL FIXED INDUCTOR(3.3UH)		
L101, 102			L40-4791-19	SMALL FIXED INDUCTOR(4.7UH)		
L103			L34-2331-05	COIL (RX)		
L104-106			L40-4791-19	SMALL FIXED INDUCTOR(4.7UH)		
L107			L34-2332-05	COIL (TX)		
L108			L40-4791-19	SMALL FIXED INDUCTOR(4.7UH)		
R1 -5			RK73GB1J473J	CHIP R 47K J 1/16W		
R6			RK73GB1J152J	CHIP R 1.5K J 1/16W		
R7			RK73GB1J222J	CHIP R 2.2K J 1/16W		
R8			RK73GB1J392J	CHIP R 3.9K J 1/16W		
R9			RK73GB1J222J	CHIP R 2.2K J 1/16W		
R10 ,11			RK73GB1J103J	CHIP R 10K J 1/16W		
R13			RK73GB1J472J	CHIP R 4.7K J 1/16W		
R14			RK73GB1J473J	CHIP R 47K J 1/16W		
R15			RK73GB1J223J	CHIP R 22K J 1/16W		
R16			RK73GB1J103J	CHIP R 10K J 1/16W		
R17			RK73GB1J221J	CHIP R 220 J 1/16W		
R101			RK73GB1J101J	CHIP R 100 J 1/16W		

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TM-702A: K, P, M, M2  
TM-702E: E, E2 indicates safety critical component

## PARTS LIST

× New Parts

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144 PLL UNIT (X58-3500-00)

144 PLL UNIT (X58-3670-11)


Ref. No. 参照番号	Address 位置	New Parts 新	Parts No. 部品番号	Description 部品名 / 規格	Desti- nation 仕向	Re- marks 備考
R102			RK73GB1J470J	CHIP R 47 J 1/16W		
R103			RK73GB1J101J	CHIP R 100 J 1/16W		
R104			RK73GB1J222J	CHIP R 2.2K J 1/16W		
R105			RK73GB1J472J	CHIP R 4.7K J 1/16W		
R106			RK73GB1J471J	CHIP R 470 J 1/16W		
R107			RK73GB1J101J	CHIP R 100 J 1/16W		
R108			RK73GB1J470J	CHIP R 47 J 1/16W		
R109			RK73GB1J682J	CHIP R 6.8K J 1/16W		
R110			RK73GB1J470J	CHIP R 47 J 1/16W		
R111			RK73GB1J101J	CHIP R 100 J 1/16W		
R112			RK73GB1J222J	CHIP R 2.2K J 1/16W		
R113			RK73GB1J472J	CHIP R 4.7K J 1/16W		
R114			RK73GB1J471J	CHIP R 470 J 1/16W		
C101			CK73GB1E103K	CHIP C		
C102			CC73GCH1H010C	CHIP C		
C103, 104			CK73GB1E103K	CHIP C		
C105			CC73GCH1H010C	CHIP C		
C106			CC73GCH1H220J	CHIP C		
C107, 108			CK73GB1H102K	CHIP C		
C109, 110			CK73GB1E103K	CHIP C		
C111			CC73GCH1H020C	CHIP C		
C112, 113			CK73GB1E103K	CHIP C		
C114			CC73GCH1H010C	CHIP C		
C115			CC73GCH1H220J	CHIP C		
C116			CK73GB1H102K	CHIP C		
D101-104			1SV166	DIODE		
IC1			M54959FP	IC(FREQ SYNTHESIZER PLL)		
Q1 , 2			2SC3324(B)	TRANSISTOR		
Q3			2SC2712(Y)	TRANSISTOR		
Q4			2SC2714(Y)	TRANSISTOR		
Q101			2SK508NV(K52)	FET		
Q102			DTC114EK	DIGITAL TRANSISTOR		
Q103			2SC3120	TRANSISTOR		
Q104			2SK508NV(K52)	FET		
Q105			DTC114EK	DIGITAL TRANSISTOR		
Q106			2SC3120	TRANSISTOR		
144 PLL UNIT (X58-3670-11) K,P						
C1			CK73FB1E223K	CHIP C 0.022UF K		
C2 , 3			CK73FB1H102K	CHIP C 1000PF K		
C4			CK73FB1E223K	CHIP C 0.022UF K		
C5			CK73FB1H471K	CHIP C 470PF K		
C6 , 7			C92-0507-05	CHIP TAN 4.7UF 6.3WV		
C8			C92-0003-05	CHIP TAN 0.47UF 25WV		
C9			CC73FB1E223K	CHIP C 0.022UF K		
C10			CK73FCH1H050C	CHIP C 5.0PF C		
C11 , 12			CK73FB1H102K	CHIP C 1000PF K		
C13 , 14			CK73FB1E223K	CHIP C 0.022UF K		
C101			CK73GB1E103K	CHIP C 0.010UF K		
C102			CC73GCH1H010C	CHIP C 1PF C		
C103, 104			CK73GB1E103K	CHIP C 0.010UF K		
C105			CC73GCH1H010C	CHIP C 1PF C		
C106			CC73GCH1H220J	CHIP C 22PF J		
C107, 108			CK73GB1H102K	CHIP C 1000PF K		
C109, 110			CK73GB1E103K	CHIP C 0.010UF K		

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144 PLL UNIT (X58-3670-11)

MIC AMP UNIT (X59-3610-00)

Ref. No. 参照番号	Address 位置	New Parts	Parts No. 部品番号	Description 部品名 / 規格	Desti- nation 仕向	Re- marks 備考
C111 C112,113 C114 C115 C116			CC73GCH1H020C CK73GB1E103K CC73GCH1H010C CC73GCH1H220J CK73GB1H102K	CHIP C 2.0PF C CHIP C 0.010UF K CHIP C 1PF C CHIP C 22PF J CHIP C 1000PF K		
CN1 CN101 CN102			E40-5201-05 E40-0411-05 E40-0311-05	PIN CONNECTOR(7P) PIN CONNECTOR(4P) PIN CONNECTOR(3P)		
			F11-1122-14	SHIELDING COVER	KP	
L1 L101,102 L103 L104-106 L107			L40-3391-19 L40-3391-19 L34-2331-05 L40-4791-19 L34-2332-05	SMALL FIXED INDUCTOR(3.3UH) SMALL FIXED INDUCTOR(3.3UH) COIL SMALL FIXED INDUCTOR(4.7UH) COIL		
L108			L40-4791-19	SMALL FIXED INDUCTOR(4.7UH)		
R1 -5 R6 R7 R8 R9			RK73FB2A473J RK73FB2A152J RK73FB2A222J RK73FB2A392J RK73FB2A222J	CHIP R 47K J 1/10W CHIP R 1.5K J 1/10W CHIP R 2.2K J 1/10W CHIP R 3.9K J 1/10W CHIP R 2.2K J 1/10W		
R10 -12 R13 R14 R15 R101			RK73FB2A103J RK73FB2A221J RK73FB2A223J R92-0670-05 RK73GB1J101J	CHIP R 10K J 1/10W CHIP R 220 J 1/10W CHIP R 22K J 1/10W CHIP R 0 OHM CHIP R 100 J 1/16W		
R102 R103 R104 R105 R106			RK73GB1J470J RK73GB1J101J RK73GB1J222J RK73GB1J472J RK73GB1J471J	CHIP R 47 J 1/16W CHIP R 100 J 1/16W CHIP R 2.2K J 1/16W CHIP R 4.7K J 1/16W CHIP R 470 J 1/16W		
R107 R108 R109 R110 R111			RK73GB1J101J RK73GB1J470J RK73GB1J682J RK73GB1J470J RK73GB1J101J	CHIP R 100 J 1/16W CHIP R 47 J 1/16W CHIP R 6.8K J 1/16W CHIP R 47 J 1/16W CHIP R 100 J 1/16W		
R112 R113 R114			RK73GB1J222J RK73GB1J472J RK73GB1J471J	CHIP R 2.2K J 1/16W CHIP R 4.7K J 1/16W CHIP R 470 J 1/16W		
D101,102 D103,104 IC1 Q1 ,2 Q3			1T33C 1SV166 M54959FP 2SC3324(B) DTC144EK	DIODE DIODE IC(FREQ SYNTHESIZER PLL) TRANSISTOR DIGITAL TRANSISTOR		
Q4 Q101 Q102 Q103 Q104			2SC2714(Y) 2SK508NV(K52) DTC114EK 2SC3120 2SK508NV(K52)	TRANSISTOR FET DIGITAL TRANSISTOR TRANSISTOR FET		
Q105 Q106			DTC114EK 2SC3120	DIGITAL TRANSISTOR TRANSISTOR		
MIC AMP UNIT (X59-3610-00)						
C1			CK73FF1E104Z	CHIP C 0.1UF Z		


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TM-702E: E,E2

 indicates safety critical components

# TM-702A/E

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MIC AMP UNIT (X59-3610-00)

ELE VOL UNIT (X59-3800-00)

Ref. No. 参照番号	Address 位置	New Parts 新	Parts No. 部品番号	Description 部品名 / 規格	Desti- nation 仕向	Re- marks 備考
C2			CK73GB1H102K	CHIP C 1000PF K		
C3			CK73FB1E333K	CHIP C 0.033UF K		
C4			CC73GCH1H270J	CHIP C 27PF J		
C5			C92-0004-05	CHIP TAN 1.0UF 16WV		
C6			CK73FB1E333K	CHIP C 0.033UF K		
C7			CK73GB1H681K	CHIP C 680PF K		
C8			CK73GB1H332K	CHIP C 3300PF K		
C9			CC73GCH1H820J	CHIP C 82PF J		
C10			CC73GCH1H101J	CHIP C 100PF J		
C11			CK73GB1H102K	CHIP C 1000PF K		
			E23-0471-05	TERMINAL		
R1			RK73GB1J223J	CHIP R 22K J 1/16W		
R2			RK73GB1J104J	CHIP R 100K J 1/16W		
R3			RK73GB1J561J	CHIP R 560 J 1/16W		
R4			RK73GB1J470J	CHIP R 47 J 1/16W		
R5			RK73GB1J561J	CHIP R 560 J 1/16W		
R6			R92-1252-05	CHIP R 0 OHM		
R7			RK73GB1J394J	CHIP R 390K J 1/16W		
R8			RK73GB1J224J	CHIP R 220K J 1/16W		
R9			RK73GB1J184J	CHIP R 180K J 1/16W		
R10			RK73GB1J333J	CHIP R 33K J 1/16W		
R11			RK73GB1J473J	CHIP R 47K J 1/16W		
R12			RK73GB1J224J	CHIP R 220K J 1/16W		
R13 -15			RK73GB1J823J	CHIP R 82K J 1/16W		
R16			R92-1252-05	CHIP R 0 OHM		
IC1			NJM4558M	IC(OP AMP X2)		
Q1			2SC4116(GR)	TRANSISTOR		
ELE VOL UNIT (X59-3800-00)						
C1			CK73FB1E104K	CHIP C 0.10UF K		
C2			C92-0004-05	CHIP TAN 1.0UF 16WV		
C3			CK73FB1H103K	CHIP C 0.010UF K		
C4			C92-0005-05	CHIP TAN 2.2UF 6.3WV		
C5 ,6			CK73FB1E104K	CHIP C 0.10UF K		
C7 ,8			C92-0507-05	CHIP TAN 4.7UF 6.3WV		
C9 ,10			CC73FSL1H101J	CHIP C 100PF J		
C11			CK73EF1C105Z	CHIP C 1.0UF Z		
C12			C92-0005-05	CHIP TAN 2.2UF 6.3WV		
			E23-0471-05	TERMINAL		
R1 ,2			RK73FB2A102J	CHIP R 1.0K J 1/10W		
R3			RK73FB2A223J	CHIP R 22K J 1/10W		
R4			RK73FB2A103J	CHIP R 10K J 1/10W		
R5			RK73FB2A223J	CHIP R 22K J 1/10W		
R6			RK73FB2A103J	CHIP R 10K J 1/10W		
R7 -10			RK73FB2A474J	CHIP R 470K J 1/10W		
R11 ,12			RK73FB2A104J	CHIP R 100K J 1/10W		
R13			RK73FB2A822J	CHIP R 8.2K J 1/10W		
R14			RK73FB2A392J	CHIP R 3.9K J 1/10W		
R15			RK73FB2A222J	CHIP R 2.2K J 1/10W		
R16			RK73FB2A102J	CHIP R 1.0K J 1/10W		
R17 ,18			RK73FB2A223J	CHIP R 22K J 1/10W		
R19 ,20			RK73FB2A472J	CHIP R 4.7K J 1/10W		
IC1			NJM4558M	IC(OP AMP X2)		


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TM-702E: E,E2

 indicates safety critical components.

## PARTS LIST

× New Parts

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ELE VOL UNIT (X59-3800-00)

Ref. No. 参照番号	Address 位置	New Parts 新	Parts No. 部品番号	Description 部品名 / 規格	Desti- nation 仕向	Re- marks 備考
IC2			BU4053BF	IC		
IC3			LC7532M	IC(BILATERAL SWITCH)		
IC4 ,5			BU4094BF	IC		
IC6			BU4053BF	IC		
Q1 -4			DTC143EK	DIGITAL TRANSISTOR		
Q5 ,6			2SD1757K	TRANSISTOR		

E: Scandinavia &amp; Europe K: USA P: Canada W: Europe

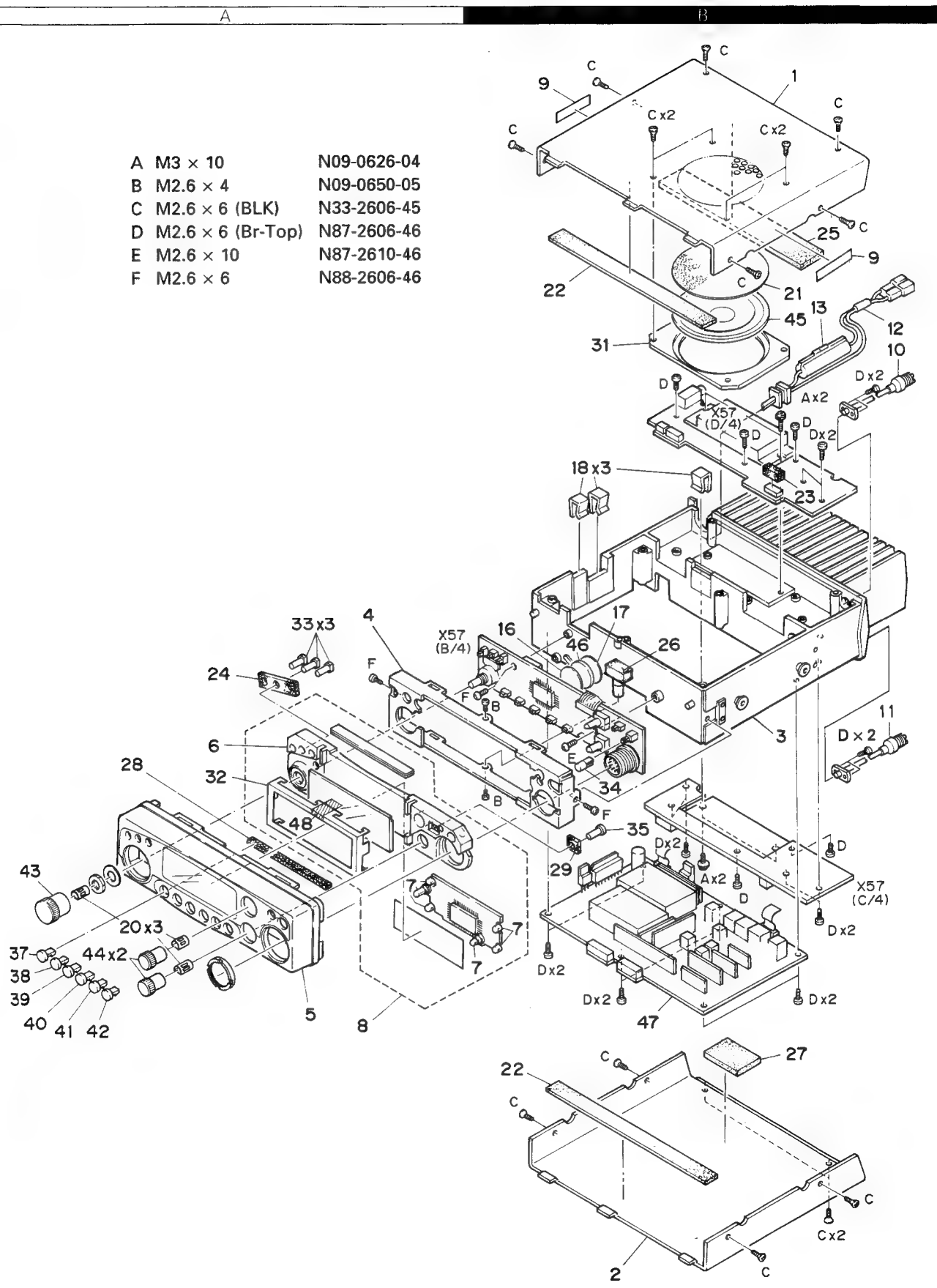
U: PX(Far East, Hawaii) T: England M: Other Areas

UE: AAFES(Europe) X: Australia

TM-702A: K,P,M,NZ  
TM-702A: E,E2 indicates safety critical components.

# TM-702A/E

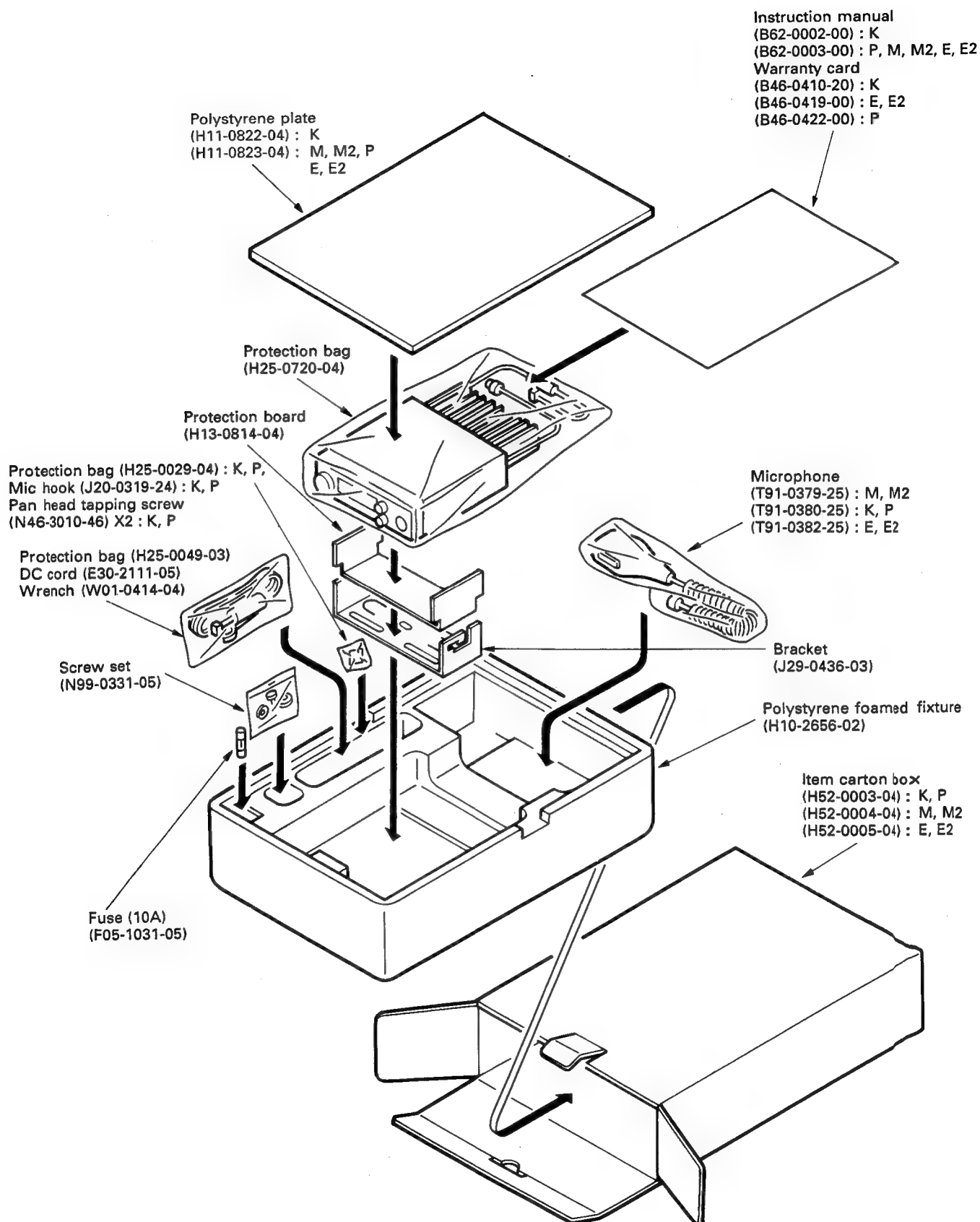
## EXPLODED VIEW



Parts with the explode numbers larger that 700 are not supplied.



## PACKING



# TM-702A/E

## ADJUSTMENT

### REQUIRED TEST EQUIPMENT

1. **DC V.M and Tester**
  - 1) High input impedance
2. **RF VTVM (RF V.M)**
  - 1) Input impedance : 1M $\Omega$  min., 2pF max.
  - 2) Voltage range : F.S = 10mV to 300V
  - 3) Frequency range : Up to 450MHz
3. **Frequency Counter (f. counter)**
  - 1) Input sensitivity : Approx, 50mV
  - 2) Frequency range : Up to 450MHz
4. **DC Power Supply**
  - 1) Voltage : 10V to 17V, variable
  - 2) Current : 8A min.
5. **Power Meter**
  - 1) Measurement range : Approx, 30W, 3W, 1W
  - 2) Input impedance : 50 $\Omega$
  - 3) Frequency range : 450MHz
6. **AF VTVM (AF V.M)**
  - 1) Input impedance : 1M $\Omega$  min.
  - 2) Voltage range : F.S = 1mV to 30V
  - 3) Frequency range : 50Hz to 10kHz
7. **AF Generator (AG)**
  - 1) Output frequency : 100Hz to 10kHz
  - 2) Output voltage : 0.5mV to 1V
8. **Linear Detector**
  - 1) Frequency range : 450MHz
9. **Spectrum Analyzer**
  - 1) Frequency range : 450MHz
10. **Directional Coupler**
11. **Oscilloscope**
  - 1) High sensitivity oscilloscope with horizontal input terminal
12. **SSG**
  - 1) Frequency range : 144MHz band
  - 2) Modulation: AM and FM MOD.
  - 3) Output level : -20dB $\mu$  ~ 100dB $\mu$
13. **Dummy Load**
  - 1) 8 $\Omega$ , 5W (approx.)
14. **Noise Generator**
  - 1) Must generate ignition-like noise containing harmonics beyond 450MHz.

### 15. Sweep Generator

- 1) Sweep range : 144MHz bands

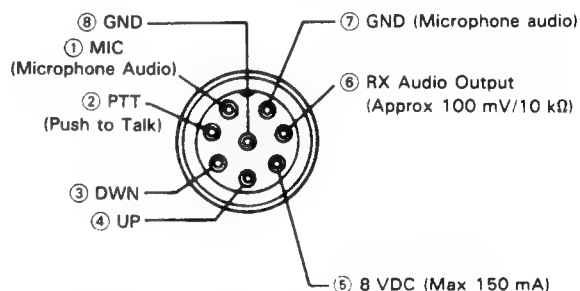
### 16. Tracking Generator

### PREPARATION

- 1) Unless otherwise specified, knobs and switches should be set as follows **Table 7**.

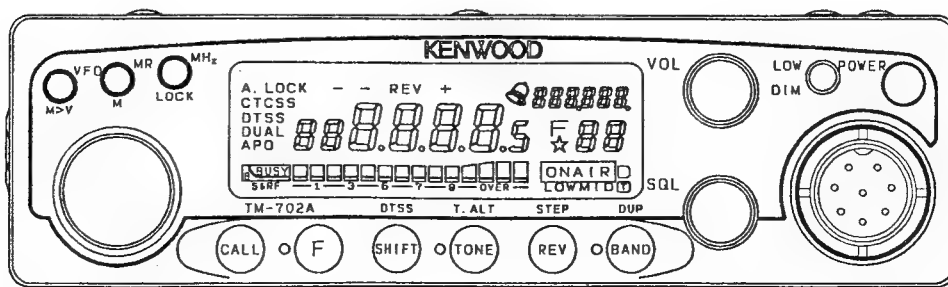
POWER SW	ON	CALL SW	OFF
AF VOL VR	MIN	SHIFT/DTSS	OFF
SQL VOL VR	MIN	ONE/T,ALT	OFF
LOW SW	OFF	REV/STEP	OFF
VFO, MR/M	VFO	BAND/DUP	OFF

**Table 7**



**Fig. 17 MIC terminals (view from front panel side)**

- 2) Use an insulated adjusting rod to adjust trimmer and coils.
- 3) To prevent damaging SSG, never set the stand by switch to SEND while adjusting the receiver section.
- 4) Be sure to turn the power switch OFF, before connecting the power cable to a power source.
- 5) Meter and display section should be set as follows **Fig. 18**.



**Fig. 18**

## ADJUSTMENT


### COMMON SECTION ADJUSTMENT

Item	Condition	Measurement			Adjustment			Specifications/Remarks
		Test-equipment	Unit	Terminal	Unit	Parts	Method	
1. Setting	1) Source voltage: DC 13.8V POWER SW: OFF VOL SW: OFF SQL VR: MAX							
2. Reset	1) Turn POWER SW ON while holding down MR/M.							Display 144.000 Display 430.000 M. M2. E. E2 440.000 K. P

### PLL SECTION ADJUSTMENT

Item	Condition	Measurement			Adjustment			Specifications/Remarks
		Test-equipment	Unit	Terminal	Unit	Parts	Method	
1.VCO voltage	1) FREQ. : 144.975 E. E2 FREQ. : 146.000 K. M. M2. P Receive	DC V.M	TX-RX	TP5			Check	2.5V or more.
	2) Transmit	Power meter	Rear panel	ANT1 (144M)				4.5 ~ 6.5V "ON AIR" light on.
	3) FREQ. : 435.000 M. M2. E. E2 FREQ. : 445.000 K. P Receive		TX-RX	TP4				2.5V or more.
	4) Transmit		Rear panel	ANT2 (430M)				6.0V "ON AIR" light on.

### RECEIVER SECTION ADJUSTMENT

Item	Condition	Measurement			Adjustment			Specifications/Remarks
		Test-equipment	Unit	Terminal	Unit	Parts	Method	
1. Helical (430 MHz)	1) FREQ. : 435.050 M. M2. E. E2 FREQ. : 445.050 K. P Connect the tracking generator to ANT2. Connect the spectrum analyzer to TP1.	Tracking generator Spectrum analyzer	Rear panel TX-RX	ANT2 (430M) TP1	TX-RX	TC1, 2 L8, 9	Check whether required band obtained at max. gain.	440 445 450(K.P) 430 435 440(M.M2.E.E2) 
2-1. GAIN (144MHz)	1) FREQ. : 145.050 E. E2 FREQ. : 146.050 K. P. M. M2 SSG output: 0.5μV (-113dBm) SSG MOD: 1kHz SSG DEV : 3kHz	SSG DC V.M	Rear panel TX-RX	ANT1 (144M) TP2	TX-RX	L1-5	MAX.	
2-2. GAIN (430 MHz)	1) FREQ. : 435.050 M. M2. E. E2 FREQ. : 445.050 K. P SSG output: 0.5μV (-113dBm) SSG MOD: 1kHz SSG DEV : 3kHz	SSG DC V.M	Rear panel TX-RX	ANT2 (430M) TP2		L12		8:00 ~ 11:00 0.6A or less.
3. Squelch	1) SQL VR : Threshold point	AF V.M	Rear panel	SP	Front panel	SQL VR	Turn the SQL VR clockwise to the point at which squelch just close.	
	2) Tight squelch FREQ. : 435.050 M. M2. E. E2 FREQ. : 445.050 K. P SSG output: 0.22μV (-120dBm) SSG MOD: 1kHz SSG DEV : 3kHz SQL VR : MAX	SSG AF V.M SP	Rear panel Front	ANT2 (430M) EXT.SP	TX-RX	VR1 (CCW)	Set to the point at which squelch just open.	
4. SUB BAND squelch [DUAL]	1) FREQ. : 145.050 E. E2 FREQ. : 146.050 M. M2. K. P SQL VR : MAX SSG output: 0.1μV (-127dBm) SSG MOD: 1kHz SSG DEV : 3kHz	SSG AF V.M SP	Rear panel	SP	TX-RX	VR8	Set to the point at which SUB squelch just open.	
	2) SSG output: 0.08μV (-129dBm)							SUB squelch close

# TM-702A/E


## ADJUSTMENT

Item	Condition	Measurement			Adjustment			Specifications/Remarks
		Test-equipment	Unit	Terminal	Unit	Parts	Method	
5-1 S-meter (144MHz)	1) FREQ. : 146.050 M. M2. E. E2 FREQ. : 145.050 K. P SSG output: 4μV (-95dBm) SSG MOD: 1kHz SSG DEV : 3kHz	SSG S-meter	Rear panel Front panel	ANT1 (144M)	TX-RX	VR7	Last S-meter segment off.	
	2) SSG output: OFF	S-meter	Front panel				Check	S-meter off.
5-2 S-meter (430MHz)	1) FREQ. : 435.050 M. M2. E. E2 FREQ. : 445.050 K. P SSG output: 4μV (-95dBm) SSG MOD: 1kHz SSG DEV : 3kHz	SSG S-meter	Rear panel Front panel	ANT2 (430M)	TX-RX	VR2 (CCW)	Last S-meter segment off.	
	2) SSG output: OFF	S-meter	Front panel				Check	S-meter off.
6-1 Receiving sensitivity (144MHz)	145.050 MHz E. E2 146.040 MHz K. M. M2. P SSG 0.18V (-122dBm)	SSG Oscilloscope Millivoltmeter Distortion meter	Rear panel	EXT-SP			Check	SNAD 12dB or more
	Adjust the band edge in the same way. FREQ. 144.050 MHz }— (W) E. E2 FREQ. 145.950 MHz }— K. M. P. FREQ. 144.040 MHz }— M2 FREQ. 147.950 MHz }							
6-2 Sensitivity (430MHz)	FREQ. 435.050 MHz M. M2. E. E2 FREQ. 445.050 MHz K. P SSG 0.18μV (-122dBm)	SSG Oscilloscope Millivoltmeter Distortion meter	Rear panel	EXT. SP			Check	S/N ratio of 46 dB or better
	Set the band edge in the same way. FREQ. 430.050 MHz }— M. W 439.950 MHz }— K. P 438.050 MHz }— K. P 449.950 MHz }							
7-1 Signal-to-noise (S/N) ratio with high-level signal	145.050 MHz E. E2 146.040 MHz K. M. P. M2 SSG 501μV (-53dBm) AF 0.63 V/8W	SSG Oscilloscope Millivoltmeter Distortion meter	Rear panel	EXT. SP			Check	S/N ratio of 46 dB or better
7-2 Signal-to-noise (S/N) ratio with high-level signal	FREQ. 435.050 MHz E. E2 445.050 MHz K. M. P. M2 SSG 501μV (-53dBm) AF 0.63 V/8Ω							

### COMMON TRANSMITTER SECTION ADJUSTMENT

Item	Condition	Measurement			Adjustment			Specifications/Remarks
		Test-equipment	Unit	Terminal	Unit	Parts	Method	
1. Transmit frequency	1) FREQ. 435.000 M. M2. E. E2 FREQ. 445.000 K. P Transmit	f.counter Power meter	Rear panel	ANT2 (430M)	TX-RX	TC3	435.000.0 MHz M, M2, E, E2 445.000.0 MHz K, P	±100Hz


### 144MHz TRANSMITTER SECTION ADJUSTMENT

Item	Condition	Measurement			Adjustment			Specifications/Remarks
		Test-equipment	Unit	Terminal	Unit	Parts	Method	
1. Power	1) HI POWER FREQ. : 144.975 E. E2 FREQ. : 146.000 K. M. M2. P HI/LOW SW : HI Transmit	Power meter Ammeter	Rear panel	ANT1 (144M)	430 FINAL	VR402 (CCW)	MAX Read RF meter	30W or more. All RF meter on. "ON AIR" light on.
	2) APC Transmit.					VR402	28W	±4W 8A or less.
	3) MID POWER HI/LOW SW : MID Transmit					VR5	10W Read RF meter	8~12W 10RF meter on.
	4) LOW POWER HI/LOW SW : LOW Transmit						Check Read RF meter	1.5~2.9W 6 RF meter on.
2. Protection (Current)	1) FREQ. : 144.975 E. E2 FREQ. : 146.000 K. M. M2. P ANT : Short 430 final unit VR404 : φ Transmit	Ammeter (REAR SIDE)  (FRONT SIDE)	VR404		430 FINAL	VR404 (CCW) VR4	4A	±0.2A

## ADJUSTMENT

Item	Condition	Measurement			Adjustment			Specifications/Remarks
		Test-equipment	Unit	Terminal	Unit	Parts	Method	
3. DEV	1) FREQ. : 145.100 E. E2 FREQ. : 146.100 K. M. M2. P AG : 1kHz, 28mV E. E2 AG : 1kHz, 50mV K. M. M2. P HI/LOW SW : LOW Transmit	Linear detector Oscilloscope Power meter	Rear panel	ANT1 (144M)	TX-RX	VR-4	±4.6kHz	±200Hz Check for detected waveform. • Linear detector LPF: 20KHz HPF: 50Hz De-emphasis: OFF
	2) MIC GAIN AG : 1kHz, 2.8mV E. E2 AG : 1kHz, 5.0mV K. M. M2. P Transmit						Check	±2.4 ~ 3.6kHz • Linear detector LPF: 3KHz HPF: 50Hz De-emphasis: 750μsec
4. TONE	1) FREQ. : 145.250 E. E2 FREQ. : 145.260 K. M. M2. P HI/LOW SW : LOW Transmit						Check	DEV: ±0.5 ~ 1.2kHz • Linear detector LPF: 3kHz HPF: 50kHz De-emphasis: 750μsec
5. TONE E.E2 [1750Hz]	1) FREQ. : 144.975 HI/LOW SW : LOW Transmit.						MIC TONE SW: ON	DEV: ±2.5kHz or more.

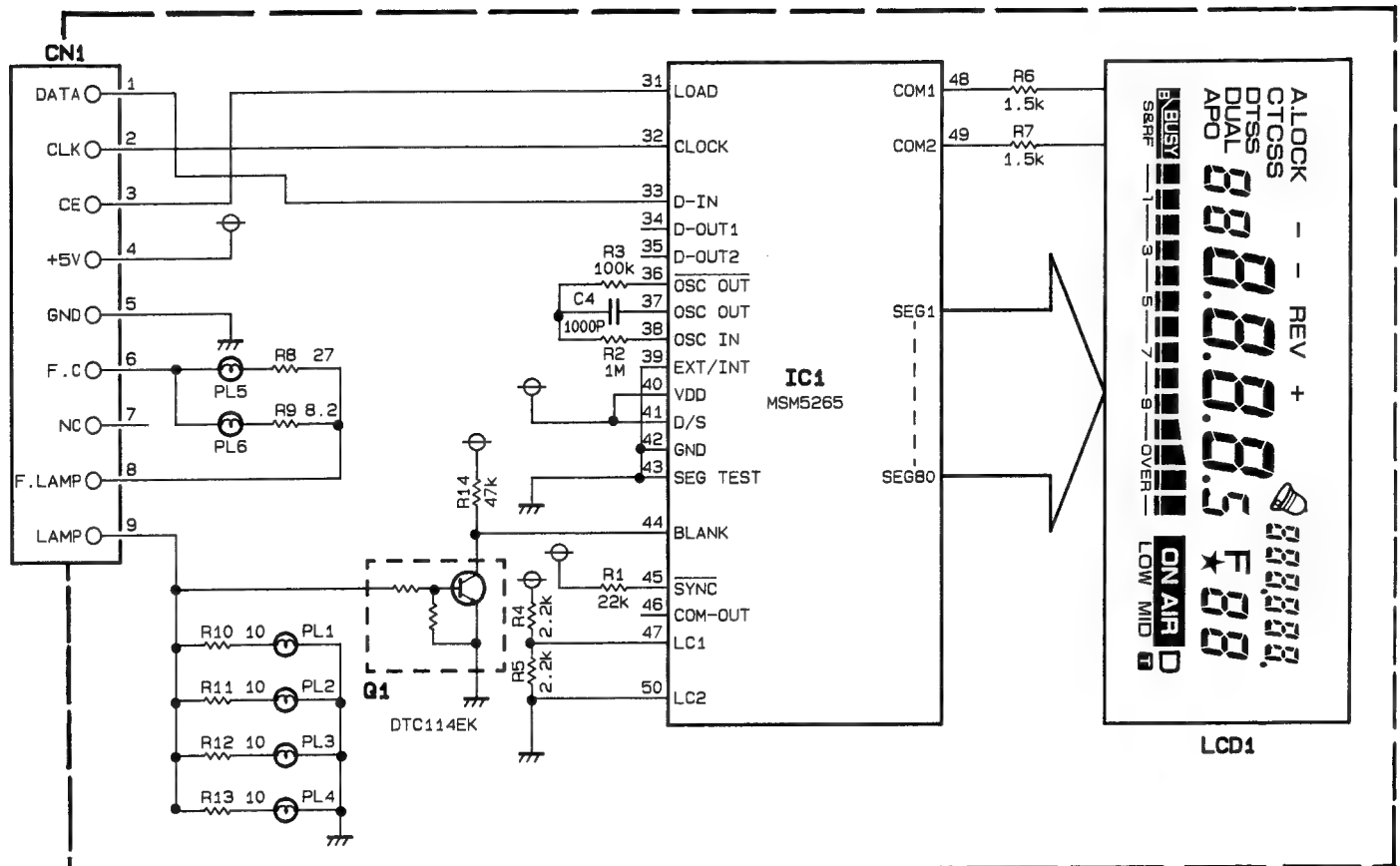
### 430MHz TRANSMITTER SECTION ADJUSTMENT

Item	Condition	Measurement			Adjustment			Specifications/Remarks
		Test-equipment	Unit	Terminal	Unit	Parts	Method	
1. Power	1) HI POWER FREQ. : 435.000 M. M2. E. E2 FREQ. : 445.000 K. P HI/LOW SW : HI Transmit	Power meter Ammeter	Rear panel	ANT2 (430M)	430 FINAL	VR401 (CCW)	MAX Read RF meter	30W or more. All RF meter on. "ON AIR" light on.
	2) APC Transmit.					VR401	28W	±4W or less 8A or less.
	3) MID POWER HI/LOW SW : MID Transmit				TX-RX	VR5	10W Read RF meter	±0.2A 10RF meter on.
	4) LOW POWER HI/LOW SW : LOW Transmit						Check	1.5~2.9W
2. Protection (Current)	1) FREQ. : 435.000 M. M2. E. E2 FREQ. : 445.000 K. P ANT : Short 430 final unit VR403 : φ Transmit	Ammeter (REAR SIDE)  (FRONT SIDE)			430 FINAL	VR403 (CCW)	3.0A	±0.2A
3. DEV	1) FREQ. : 434.960 M. M2. T. W FREQ. : 444.960 K AG : 1kHz, 28mV E. E2 AG : 1kHz, 50mV K. P. M. M2 HI/LOW SW : LOW Transmit	Linear detector Oscilloscope Power meter	Rear panel	NAT2 (430M)	TX-RX	VR3	±4.6kHz	±200Hz Check for detected waveform. • Linear detector LPF: 20KHz HPF: 50Hz De-emphasis: OFF
	2) MIC GAIN AG : 1kHz, 2.8mV E. E2 AG : 1kHz, 5.0mV K. P. M. M2						Check	±2.4 ~ 3.6kHz
4. TONE	1) FREQ. : 435.250 M. M2. E. E2 FREQ. : 445.250 K. P HI/LOW SW : LOW Transmit						Check	DEV: ±0.5 ~ 1kHz • Linear detector LPF: 3Hz HPF: 50kHz De-emphasis: 750μsec
5. TONE E. E2 type [1750Hz]	1) FREQ. : 435.000 HI/LOW SW : LOW Transmit.						MIC TONE SW: ON	DEV: ±2.5kHz or more.
6. DTMF K type	1) FREQ. : 445.100 MIC A and B key : Push at the same time. Transmit.						Check	DEV: 2.8~ 4.5kHz

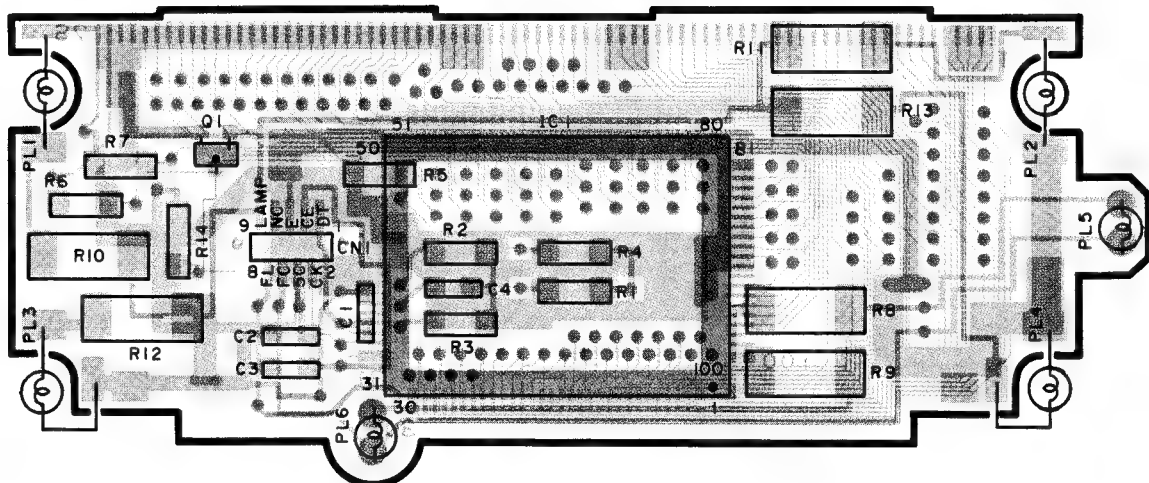


# TM-702A/E

## PC BOARD VIEW/CIRCUIT DIAGRAM



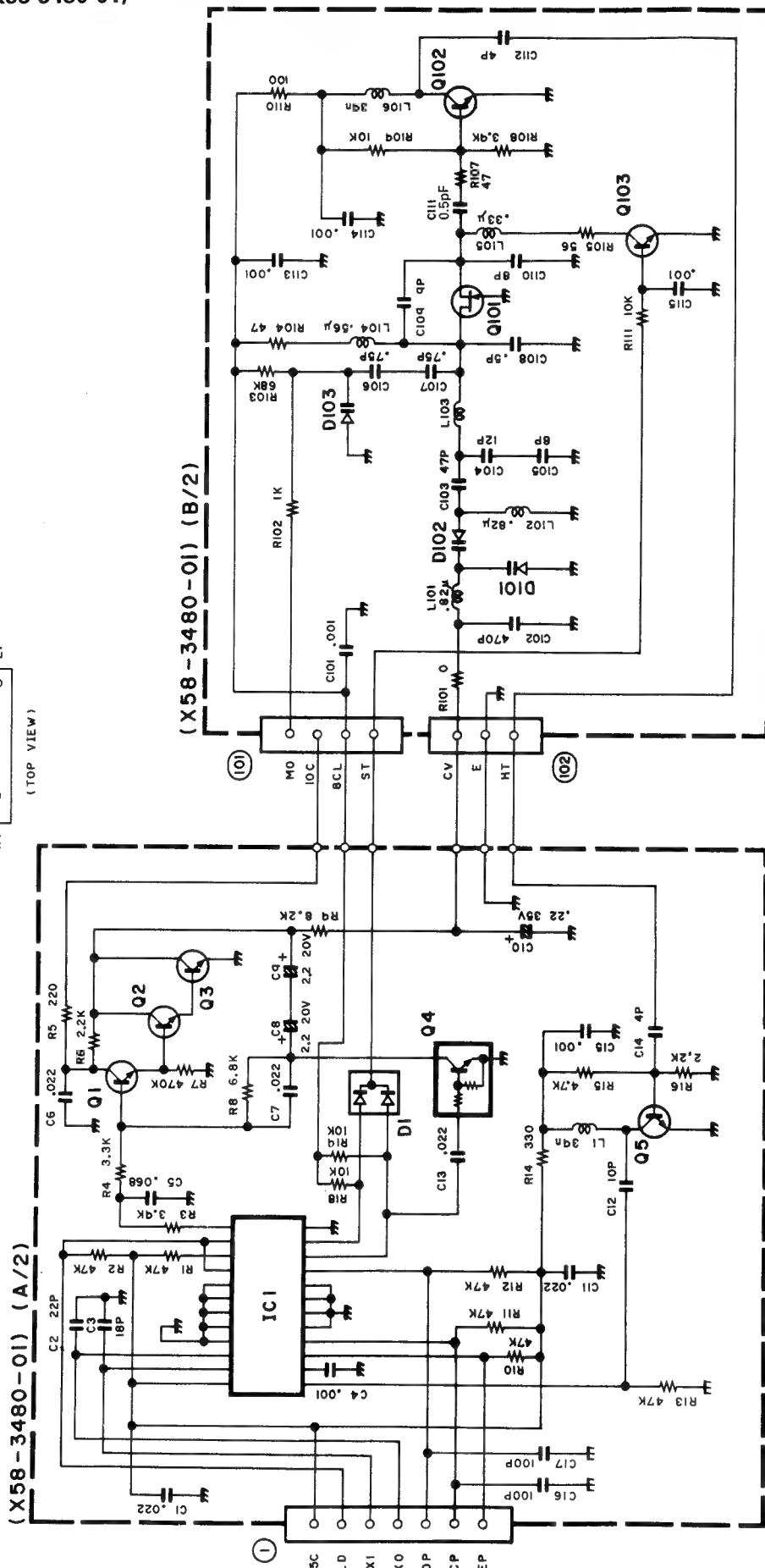
**LCD ASS'Y (B38-0348-05) Component side view**



# TM-702A/E

## CIRCUIT DIAGRAM

430PLL (X58-3480-01)



(X58-3480-01) (B/2)

Q101 : 2SK582  
Q102 : 2SC3120  
Q103 : 2SC3324 (G)  
D101, 102 : 1T33C  
D103 : 1SV164

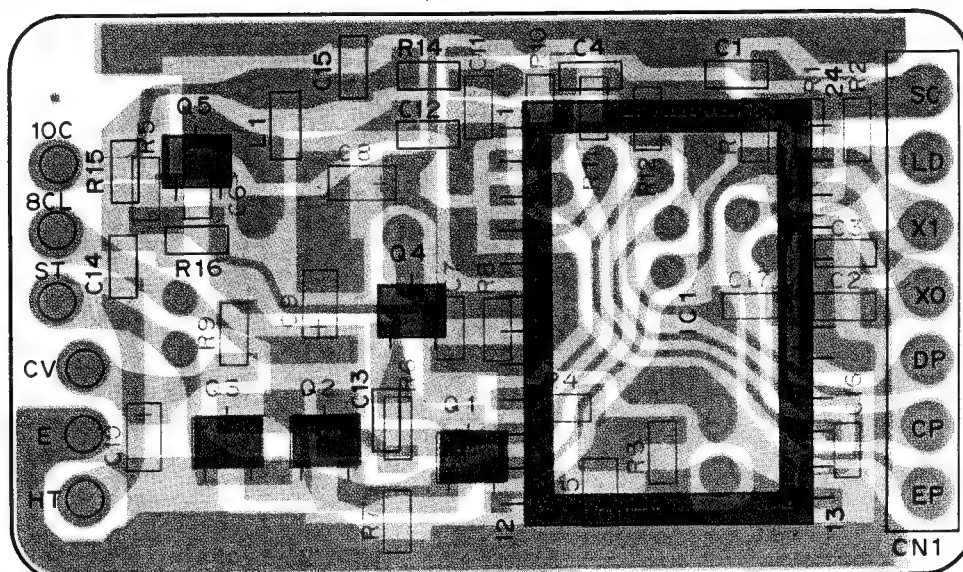
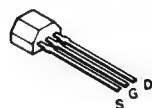
Unused numbers  
C18-100  
R17,20-100,106

(X58-3480-01) (A/2)

IC1 : M54959FP  
Q1~3 : 2SC3324 (B)  
Q4 : DTC144EK  
Q5 : 2SC2714 (Y)  
D1 : 1SS184



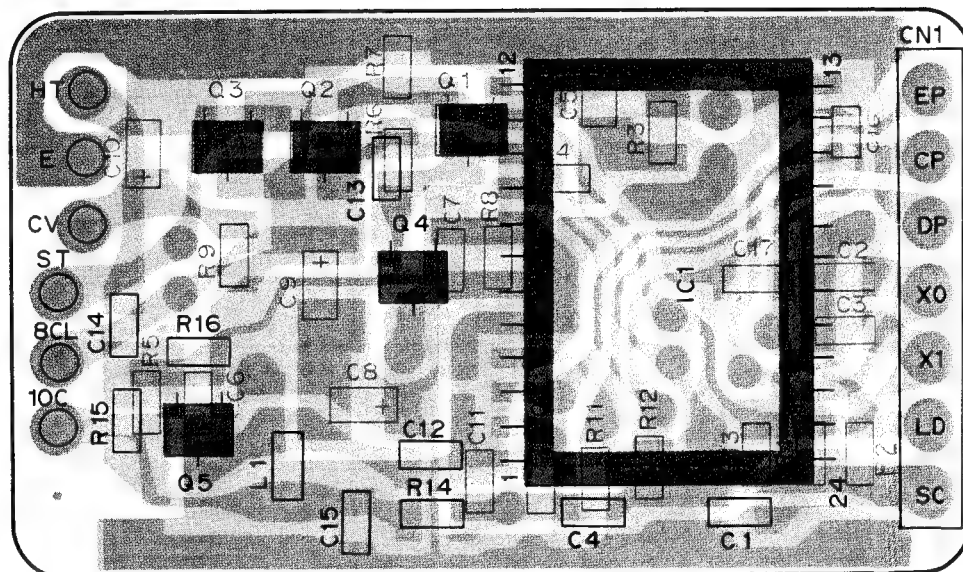
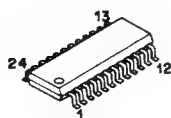
TM-702A/E



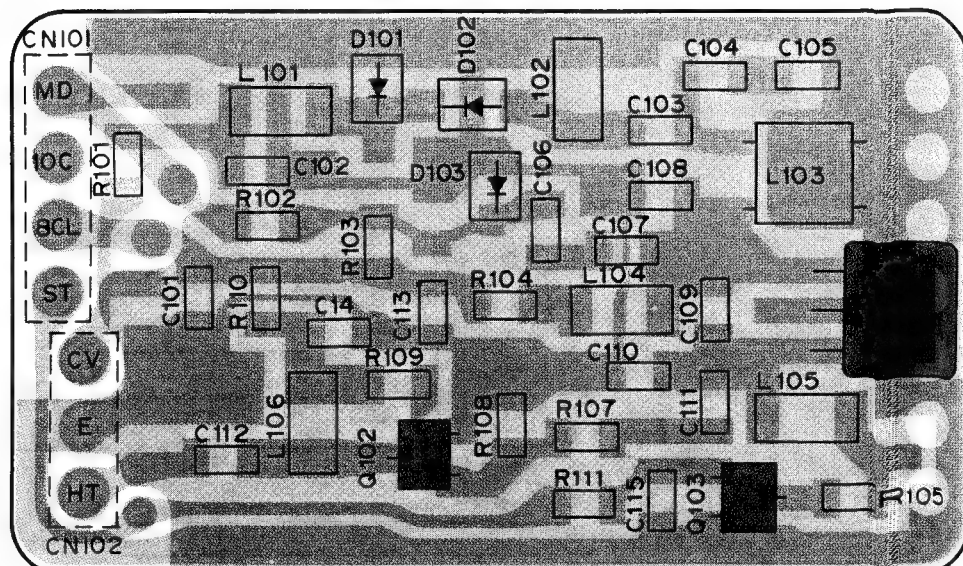
IC1 : M54959FP Q1~3 : 2SC3324 (B) Q4 : DTC144EK Q5 : 2SC2714 (Y) D1 : 1SS184

**430PLL (X58-3480-01) (A/2) Foil side view**

**M54959FP**



**430PLL (X58-3480-01) (B/2) Component side view**



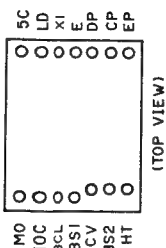
Q101 : 2SK582 Q102 : 2SC3120 Q103 : 2SC3324 (G) D101,102 : 1T33C D103 : 1SC16

# TM-702A/E

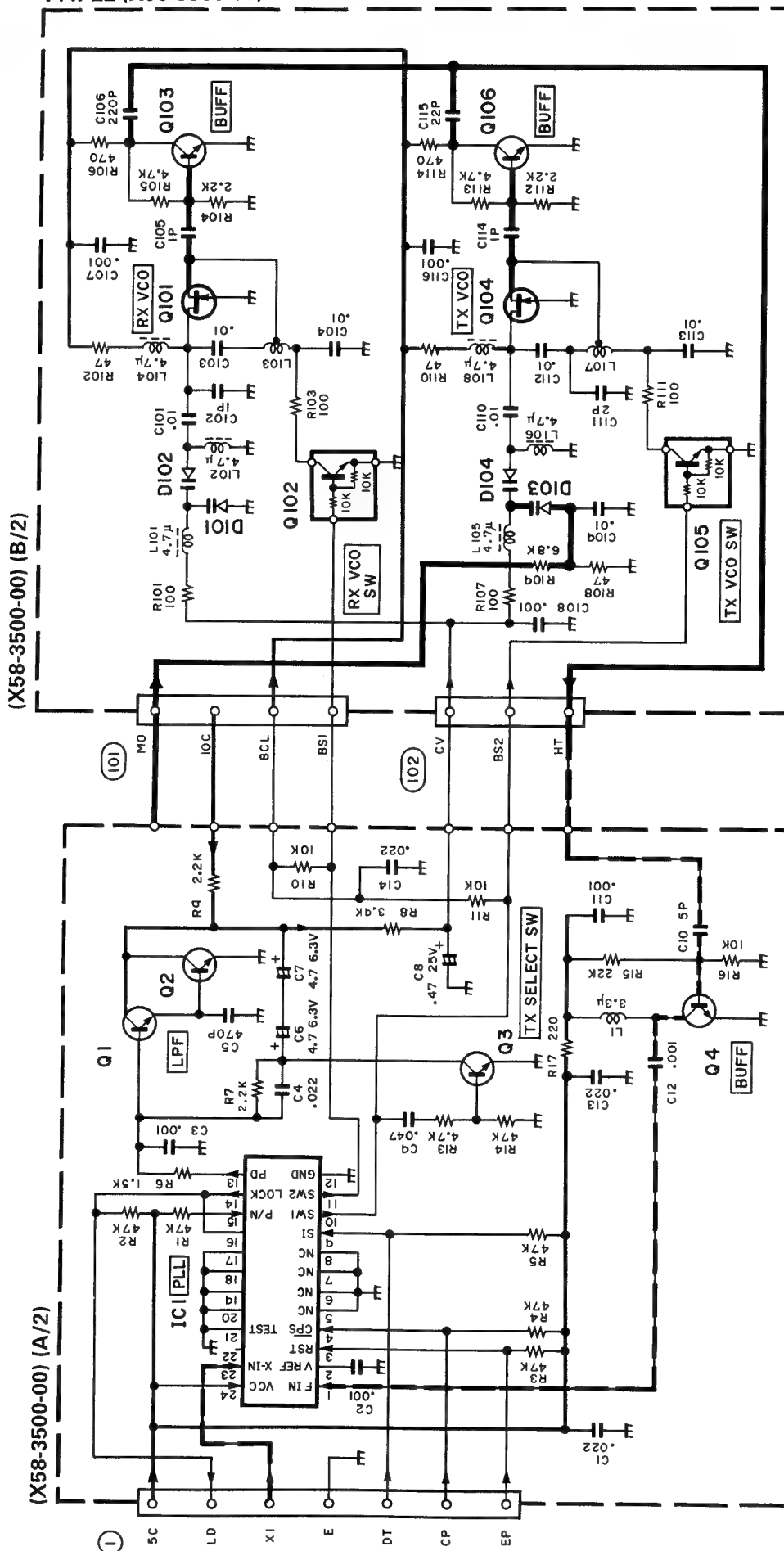
## CIRCUIT DIAGRAM

144PLL (X58-3500-00)

0~21 : M, 0~22 : M2, 2~71 : E, 2~72 : E2



(TOP VIEW)



(X58-3500-00)(B/2)  
 Q101,104 : 2SK508NV(K52)  
 Q102,105 : DTC114EK  
 Q103,106 : 2SC3120  
 D101 ~ 104 : ISV166

Unused numbers  
 C15-100  
 R12,18-100

(X58-3500-00)(A/2)  
 IC1 : M54959FP  
 Q1,2 : 2SC3324(B)  
 Q3 : 2SC2712(Y)  
 Q4 : 2SC2714(Y)

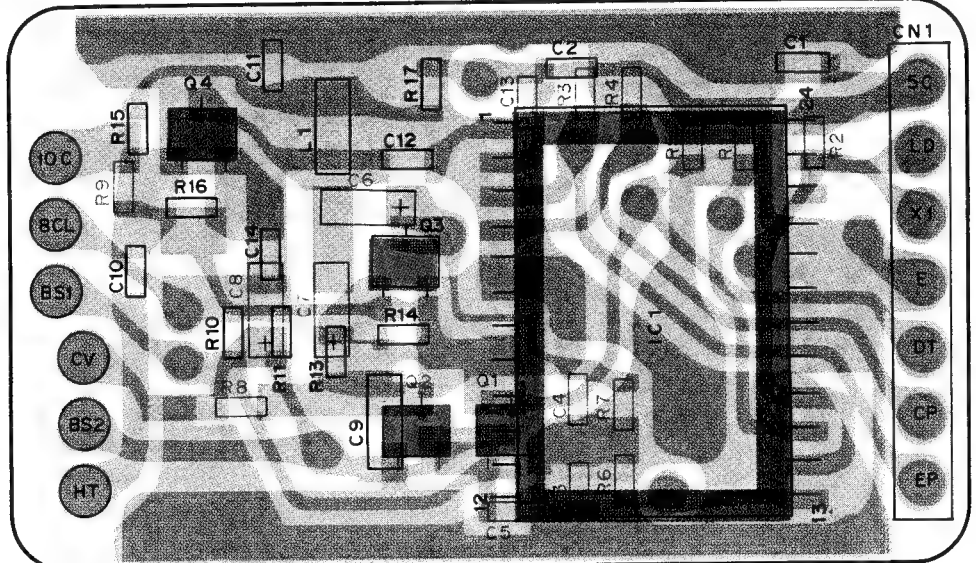
# PC BOARD VIEWS / CIRCUIT DIAGRAMS TM-702A/E

144 PLL (X58-3500-00) (A/2) Component side view 0~21 : M, 0~22 : M2, 2~71 : E, 2~72 : E2

DTC114EK  
2SC2712(Y)  
2SC2714(Y)  
2SC3120  
2SC3324(B,G)



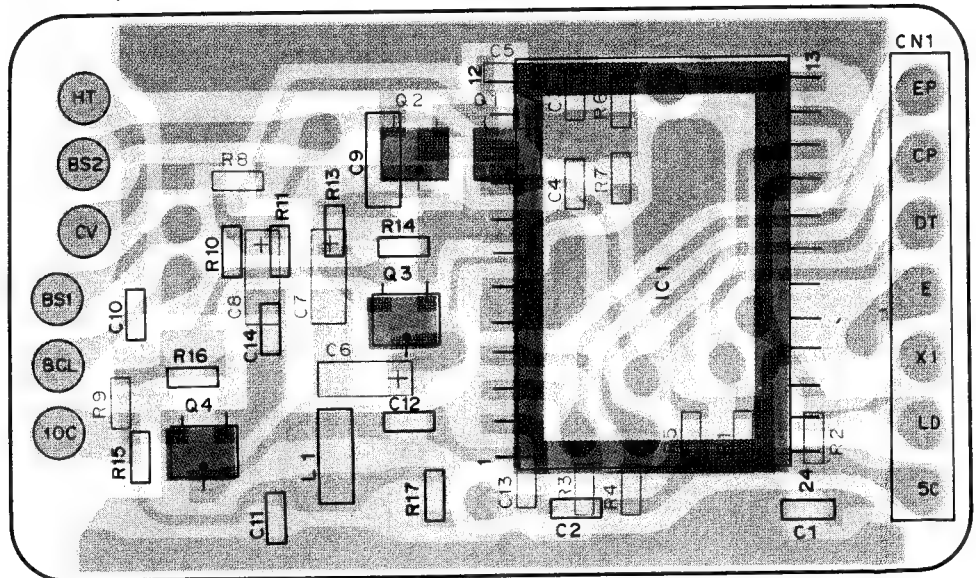
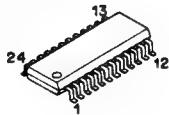
2SK508NV(K52)



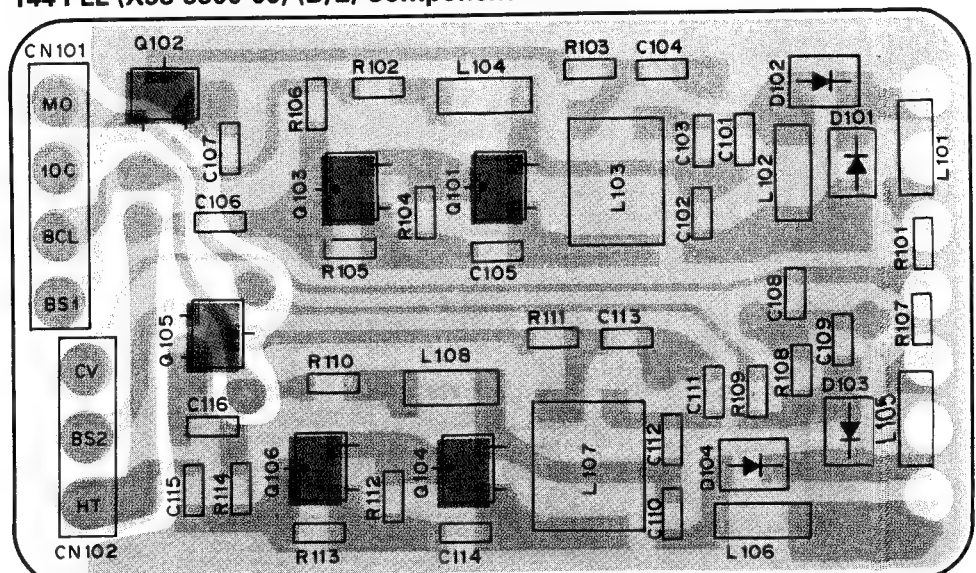
IC1 : M5459FP Q1,2 : 2SC3324 (B) Q3 : 2SC2712 (Y) Q4 : 2SC2714 (Y)

144 PLL (X58-3500-00) (A/2) Foil side view

M54959FP



144 PLL (X58-3500-00) (B/2) Component side view

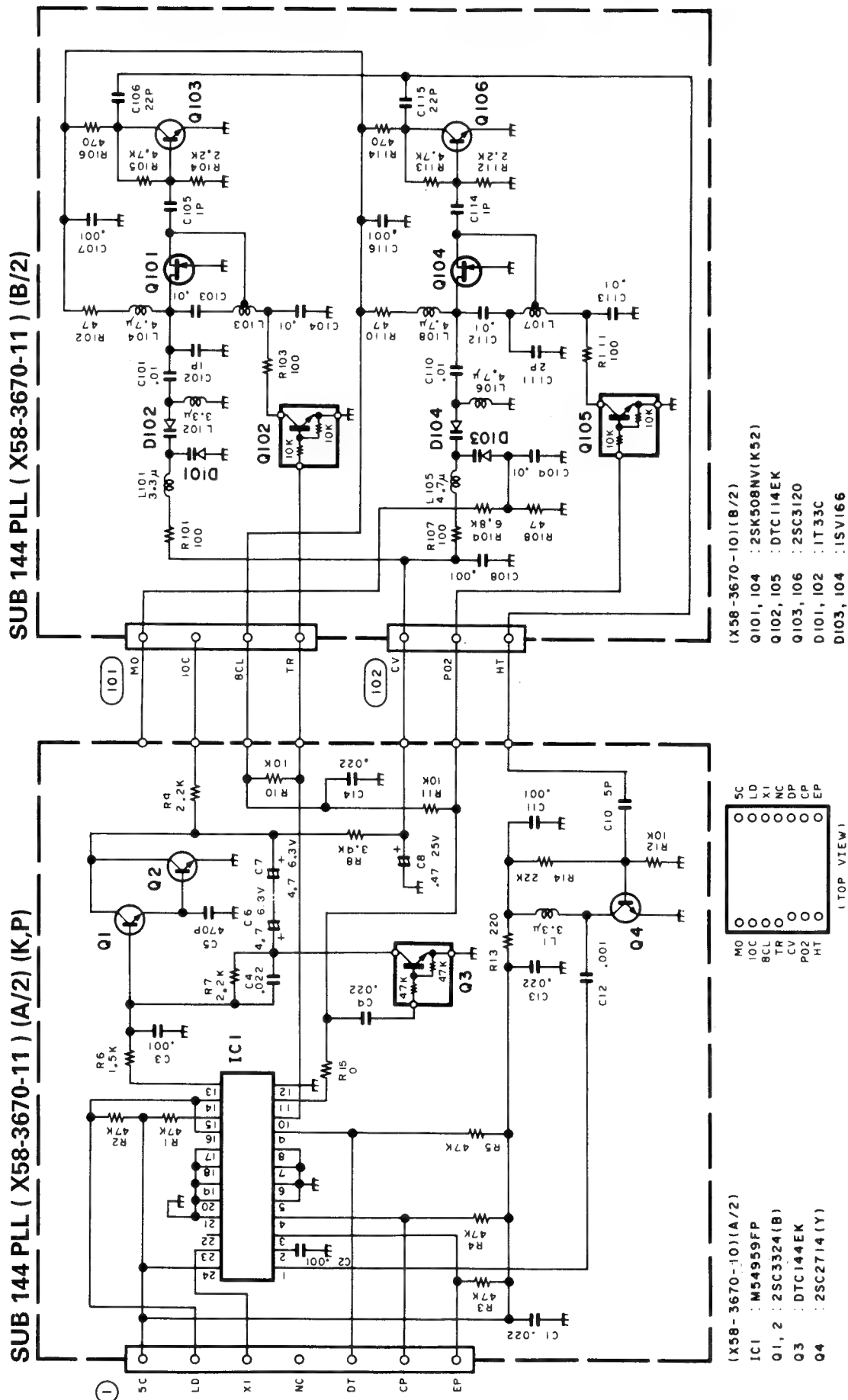


Q101,104 : 2SK508NV (K52) Q102, 105 : DTC114EK Q103,106 : 2SC3120 D101~104 : 1SV166

# TM-702A/E

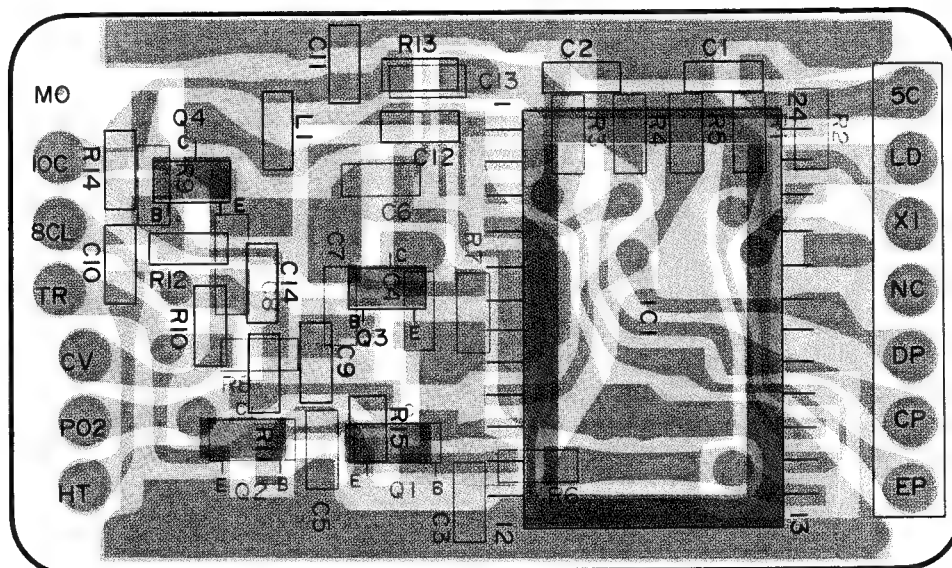
## CIRCUIT DIAGRAMS

144PLL (X58-3670-11)-11 : K. P



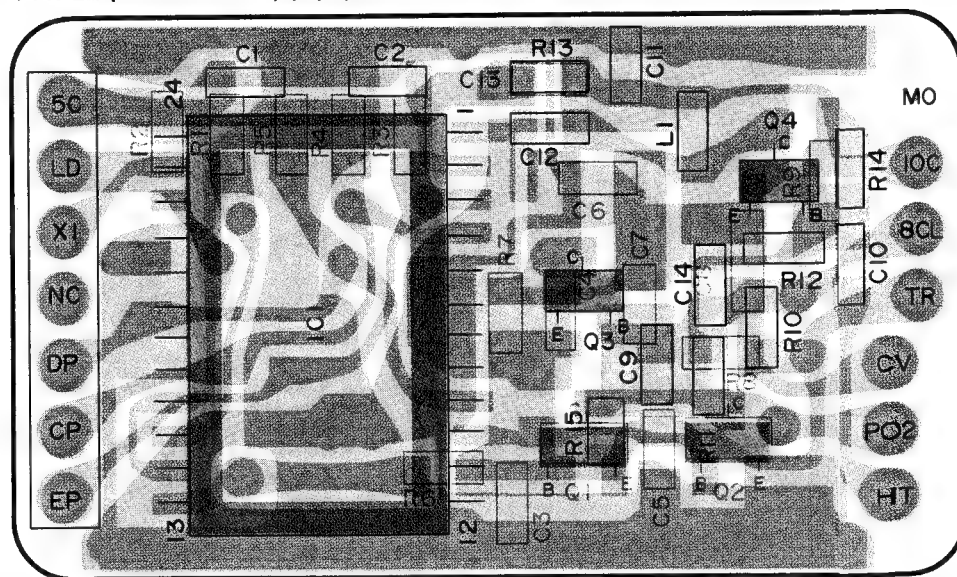


**144PLL (X58-3670-11) (A/2) Component side view-11 : K. P**

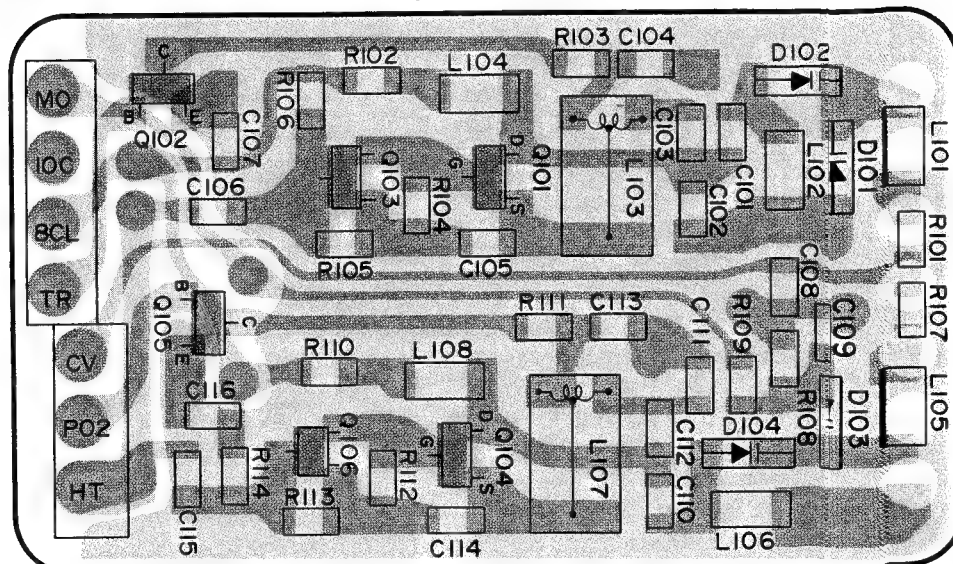


IC1: M54959 FP Q1,2:2SC3324(B) Q3:DTC144EK Q4:2SC2714(Y)

**144PLL (X58-3670-11) (A/2) Foil side view**



**144PLL (X58-3670-11) (B/2) Component side view**

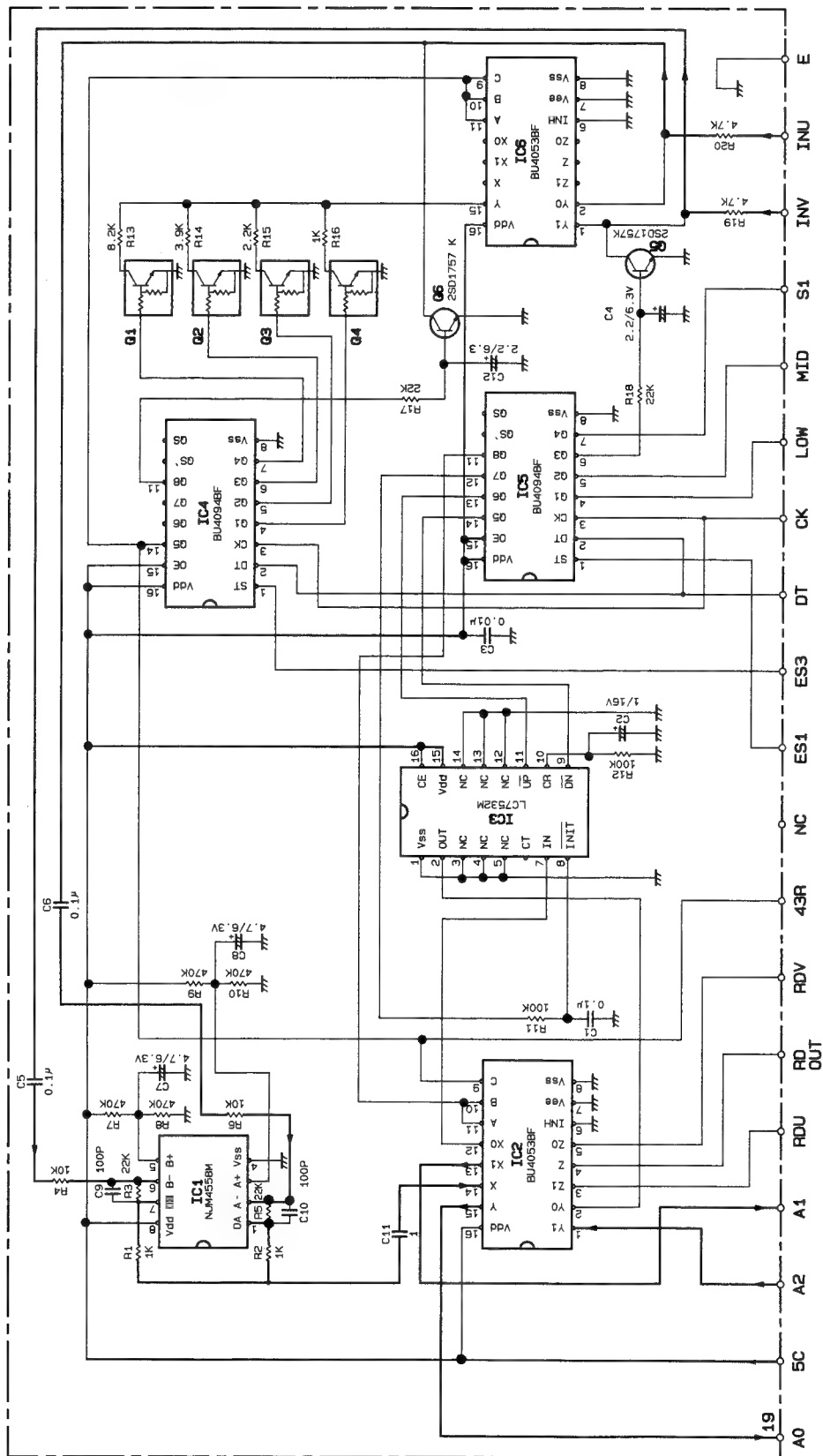


Q101,104: 2SK508NV(52) Q103,106:2SC3120 D101,102:1T33C D103,104:1SV166

# TM-702A/E

## CIRCUIT DIADRAM

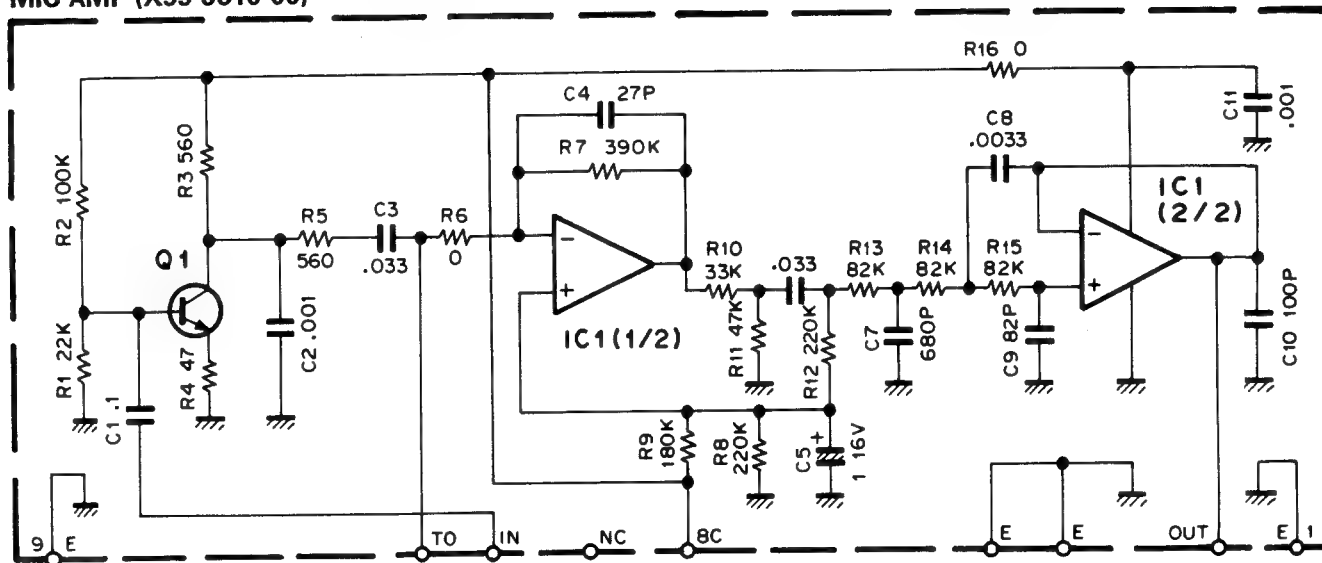
ELE VOL (X59-3800-00)



IC1 : NJM4558M Q1~4 : DTC143EK  
 IC2.6 : BU4053BF Q5.6 : 2SD1757K  
 IC3 : LC7532M  
 IC4.5 : BU4094BF

# CIRCUIT DIAGRAM/PC BOARD VIEWS TM-702A/E

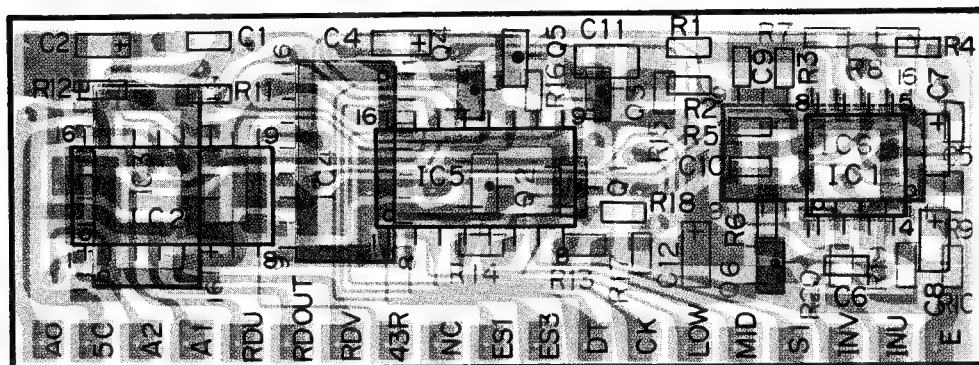
MIC AMP (X59-3610-00)



Q1 : 2SC4116 (GR)

IC1 : NJM4558M

ELE VOL (X59-3800-00) Component side view

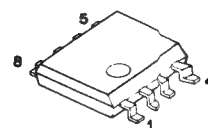


IC1: NJM4558M IC2.6: BU4053BF IC3: LC7532M IC4.5: BU4094BF Q1~4: DTC143EK Q5.6: 2SD1757K

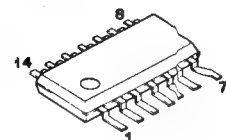
2SC4116(Y)  
2SD1757(Y)



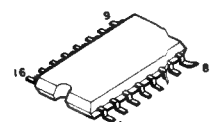
NJM4558M



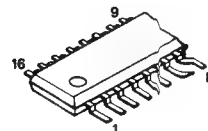
MN4066BS



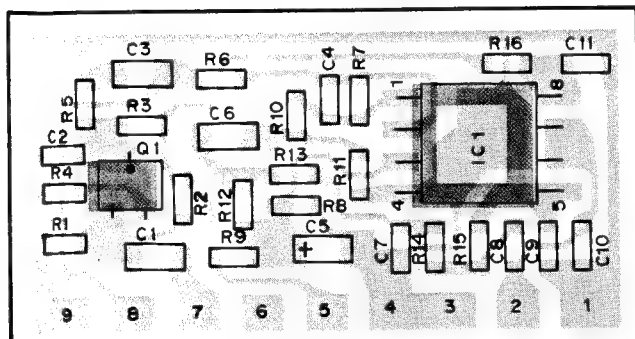
MC14094B



LC7532M



MIC AMP (X59-3610-00) Foil side view



Q1 : 2SC4116(Y) IC1 : NJM4558M

# TM-702A/E

## PC BOARD VIEWS

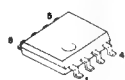
TX-RX UNIT (X57-368X-XX) (A/4)

0-11: K, P, 0-21: M, 0-22: M2 (TM-702A), 2-71: E, 2-72: E2 (TM-702E)

Component side view

DTC114EK LA5010M

2SA1162 (Y)  
2SC2712 (Y)  
2SC2714 (Y)  
2SD1757 (K)  
B, E, C



2SK208 (O)

TA7787AF  
BU4053BF



3SK131 (V12)  
3SK184 (S)



2SK582



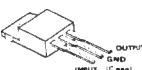
2SB1119S  
2SB1302S



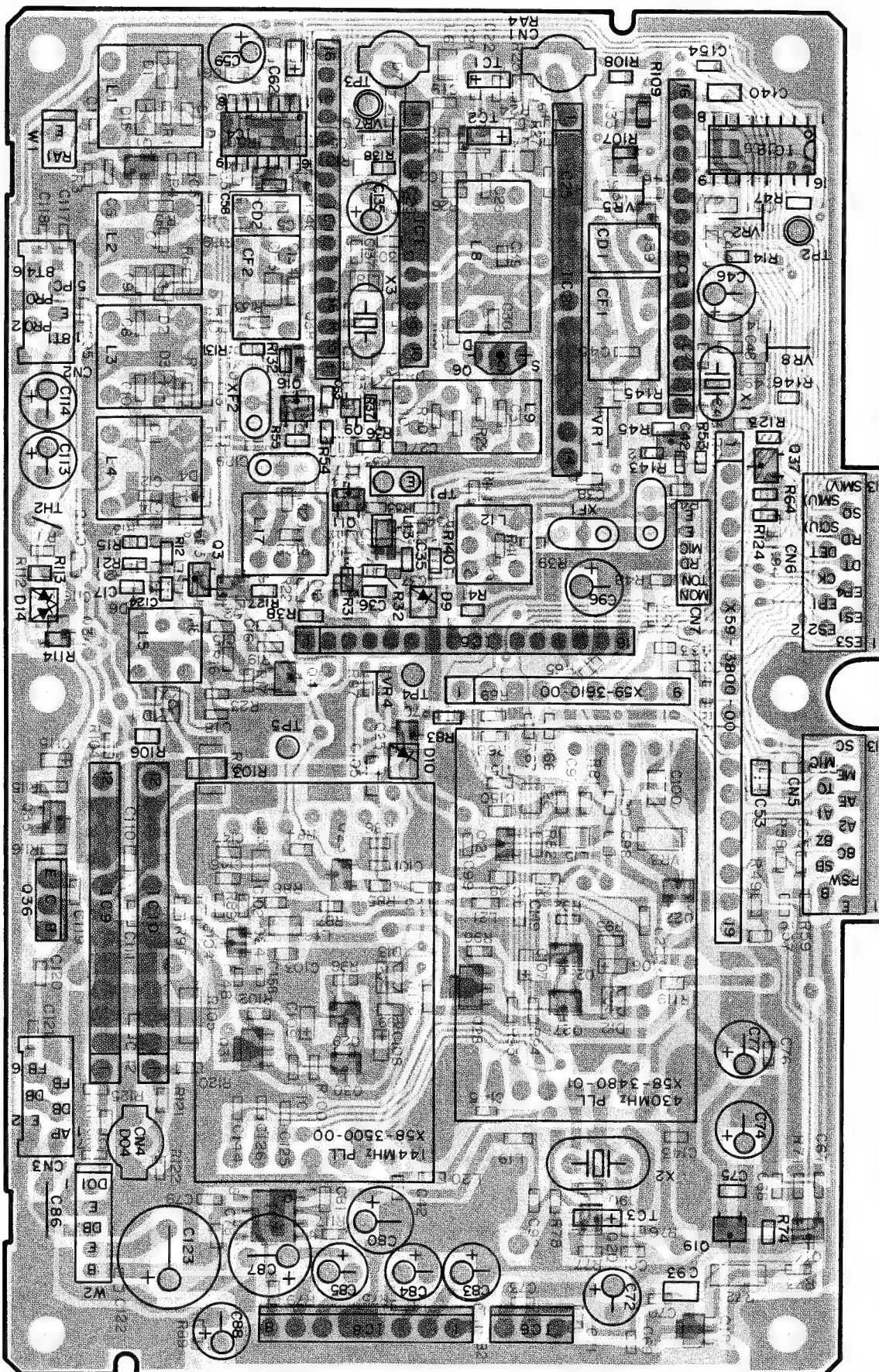
2SA1307



μPC78M08H



μPC1241H

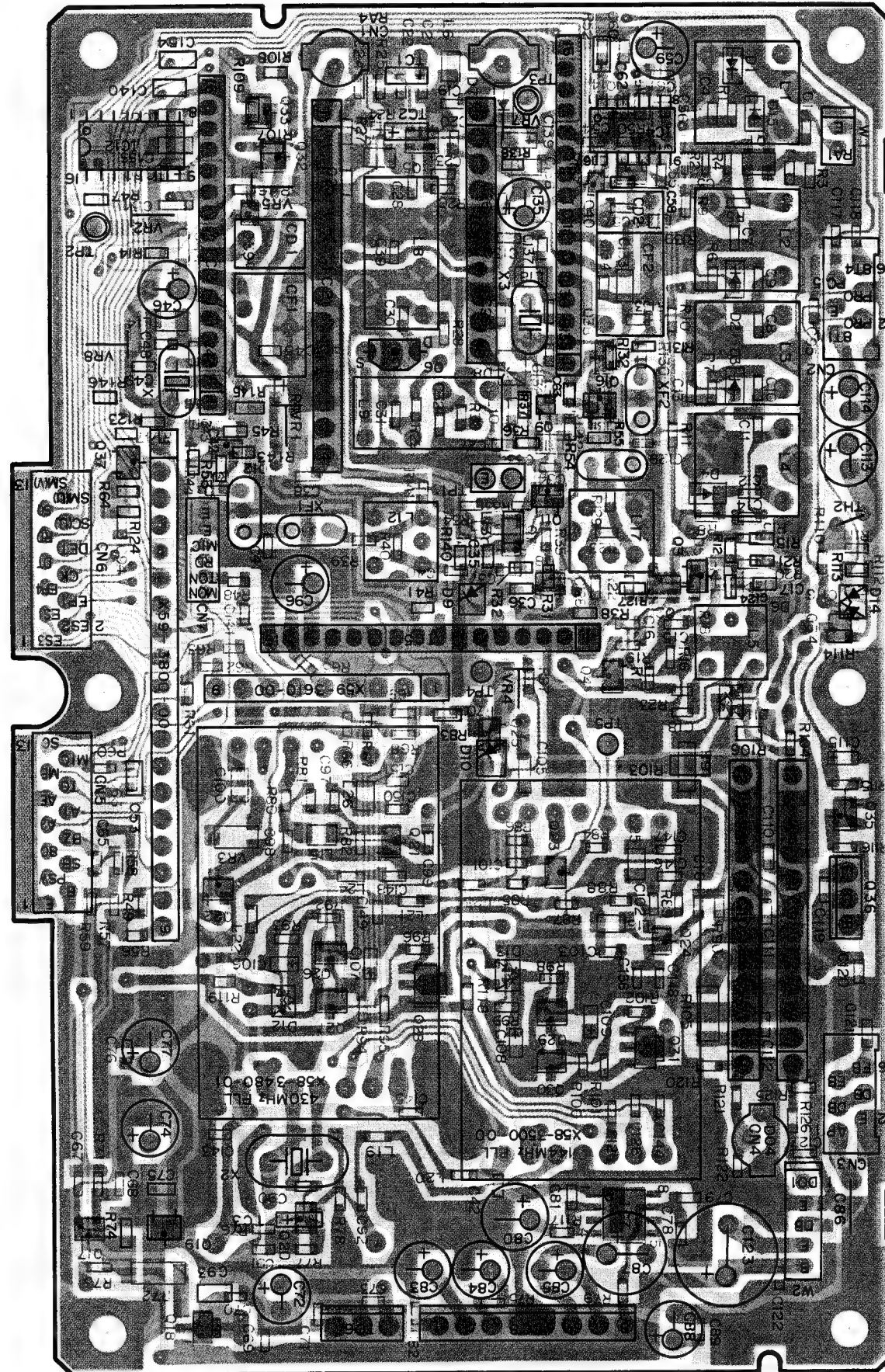




# PC BOARD VIEWS

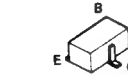
TM-702A/E

TX-RX UNIT (X57-368X-XX) (A/4) O-11: K, P, 0-21: M, 0-22: M2 (TM-702A), 2-71: E, 2-72: E2 (TM-702E)  
Foil side view

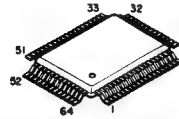


IC3, 11: KCD04 IC4: TA7787AF IC5: KCC03 IC6: UPC78M08H IC7: LA5010M IC8: UPC1241H IC9: KCB05 IC10: KCB06 IC12: BUJ053BF  
Q1, 5, 7: 3SK184 (S) Q2: 3SK131 (V12) Q3, 4, 8, 15, 22, 25, 27, 30, 32, 33: DTC114EK Q6: 2SK582 Q9: FMC3 Q12, 20, 21, 24, 38: 2SC2714 (Y)  
Q14, 17, 19, 26, 29, 35: 2SC2712 (Y) Q16, 23: 2SK208 (Y) Q18: 2SB1302S Q28, 31: 2SB1119S Q34: 2SA1162 (Y) Q36: 2SA1307 (Y)  
Q37: 2SD1757K Q39, 40: 2SJ14 4 (GR) D1 ~ 4, 15: ISV164 D5: ISV166 (K, P), ISV164 (M, M2, E, E2) D6: ISV166 D7: HSK277 D9, 10: ISV128  
D11: ISS268 D12 ~ 14: ISS184

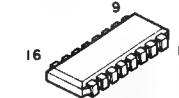
DTC143EK  
DTC114EK  
2SA1519  
2SC2712(Y)



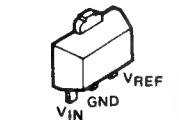
75116GF-667-3BE



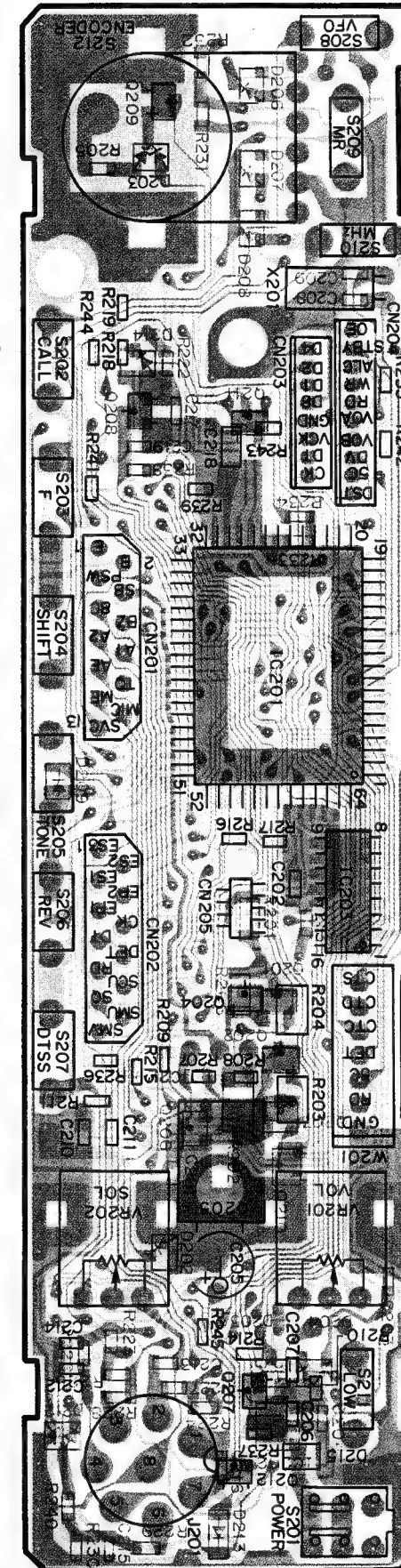
R90-0711-05



NJM78L06UA

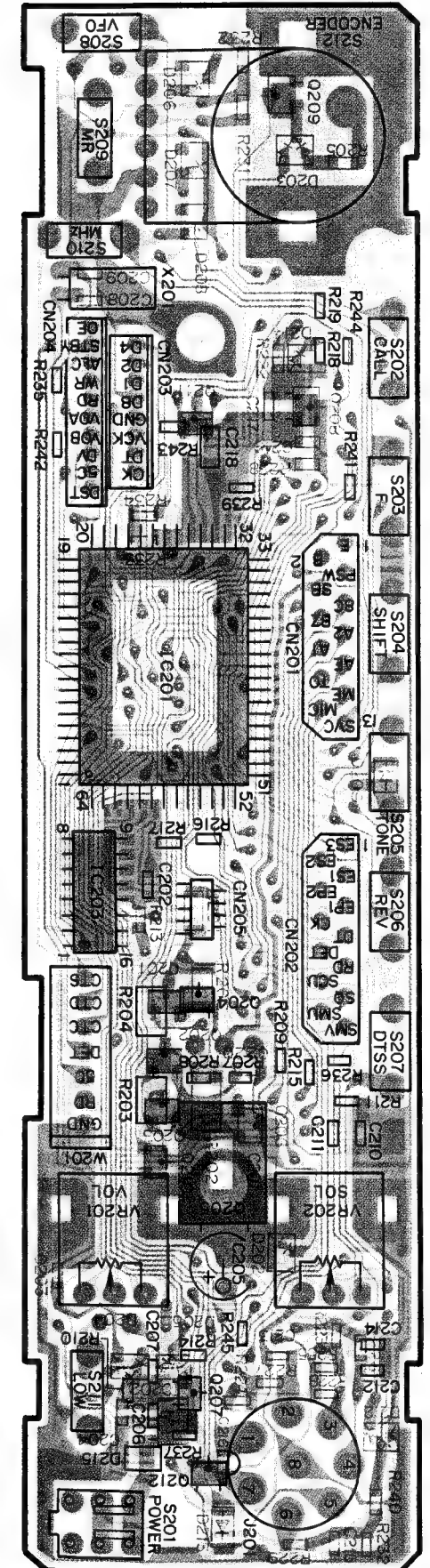


TX-RX UNIT (X57-368X-XX) (B/4) O-11: K, P, 0-21: M, 0-22: M2 (TM-702A), 2-71: E, 2-72: E2 (TM-702E)  
Component side view



IC201: 75116GF-667-3BE IC202: NJM78L06UA IC203: R90-0711-05  
Q201 ~ 204: 2SA1519 Q205: 2SD1682 (R, S) Q206 ~ 208: 2SC2712 (Y) Q209, 210, 212: DTC114EK Q211: DTC143EK  
D202: 02C29.1 (Y) D203, 205 ~ 208: ISS184 D204: ISS181 D209: MA141A D212: ISS226 D213: LF801 D214: 02C25.1 (X) D215: 02C23.0 (Z) D216: B30-0852-05

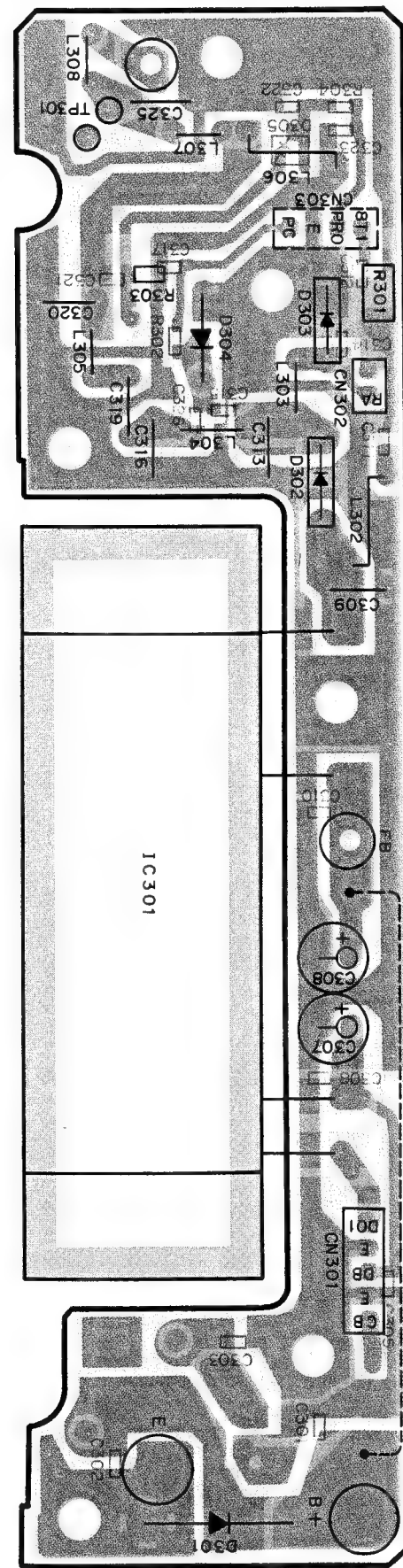
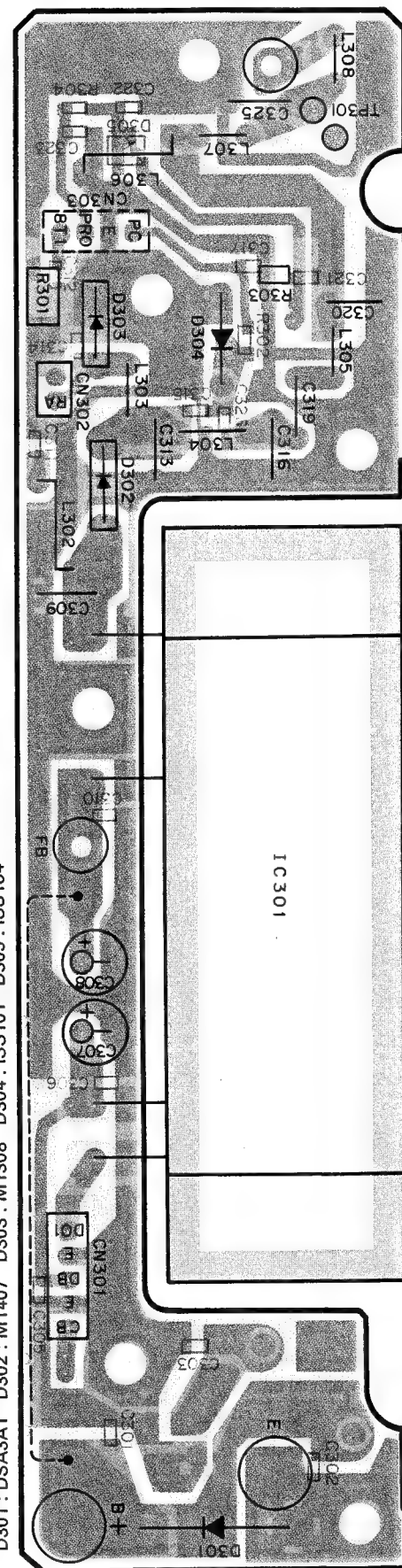
Foil side view





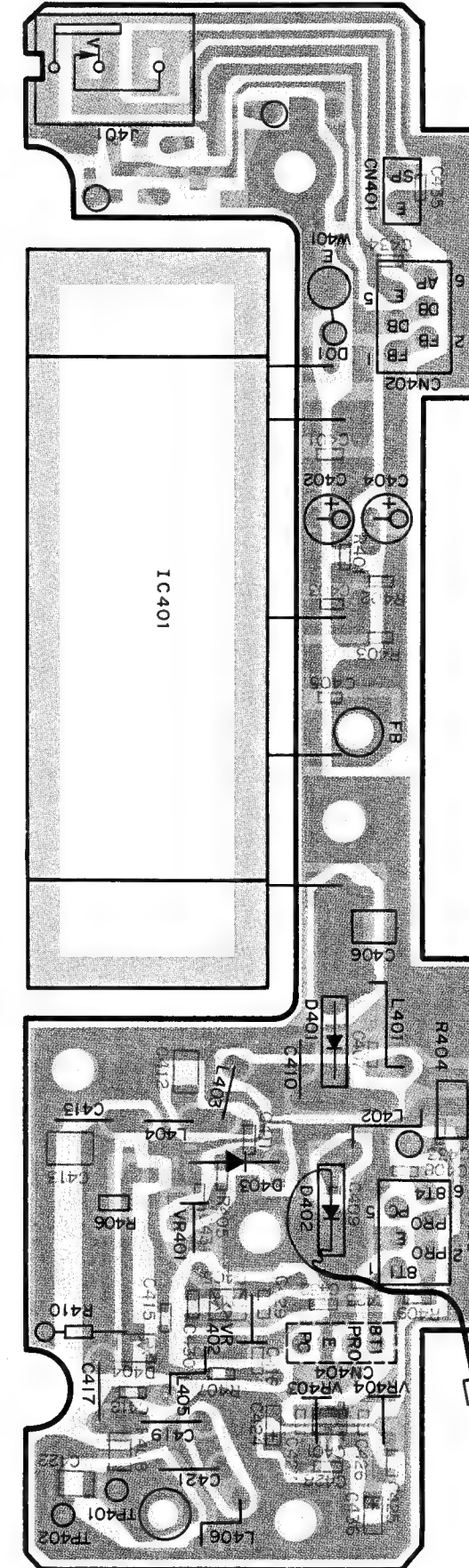
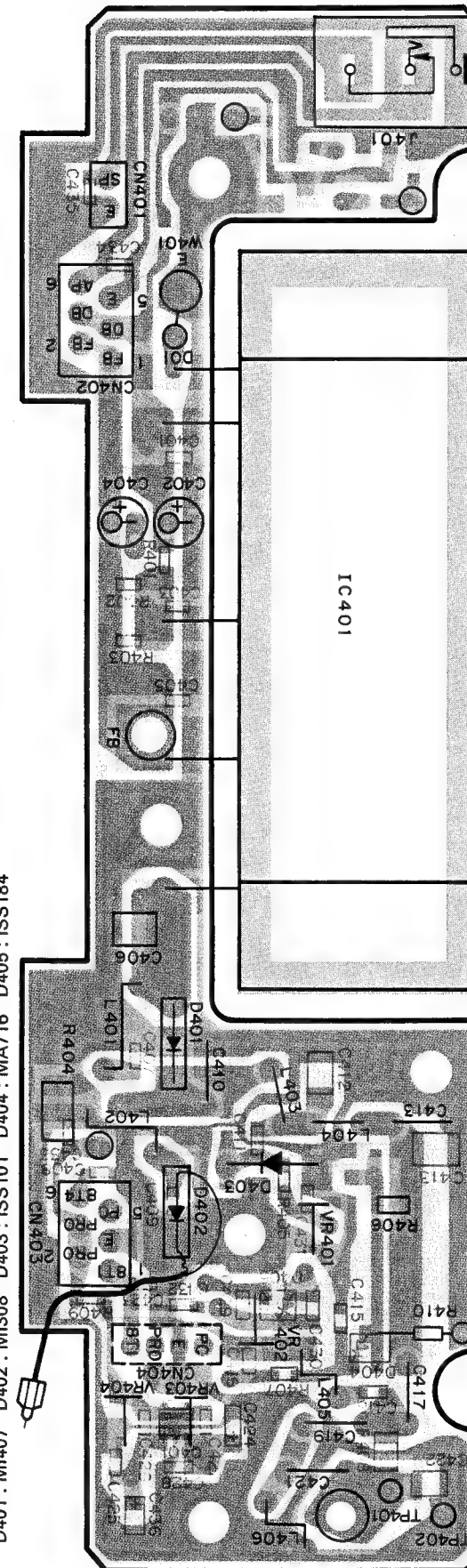
O-11: K, P, O-21: M, O-22: M2 (TM-702A), 2-71: E, 2-72: E2 (TM-702E)

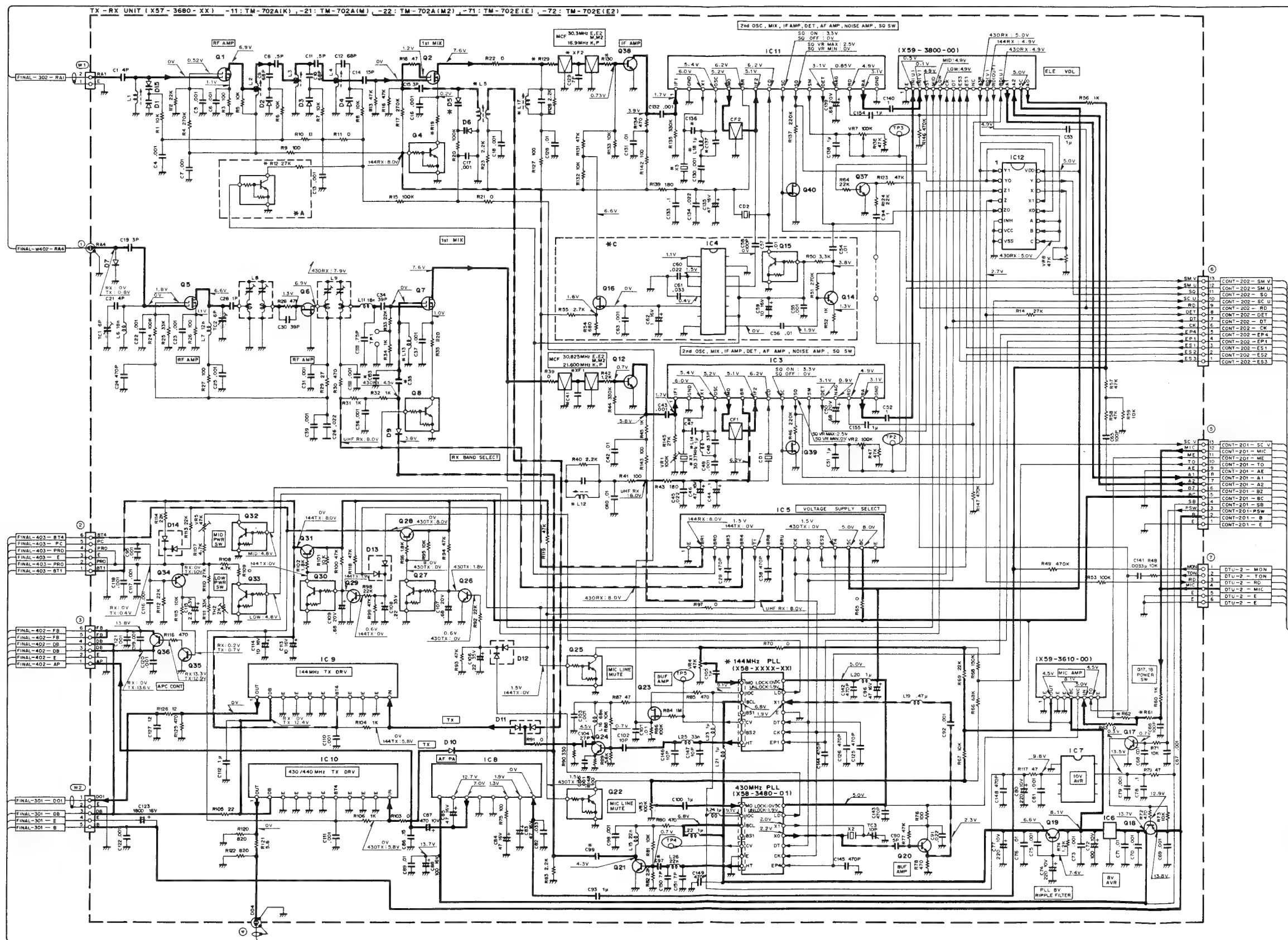
### Foil side view



O-11: K, P, O-21: M, O-22: M2 (TM-702A), 2-71: E, 2-72: E2 (TM-702E)

### Foil side view

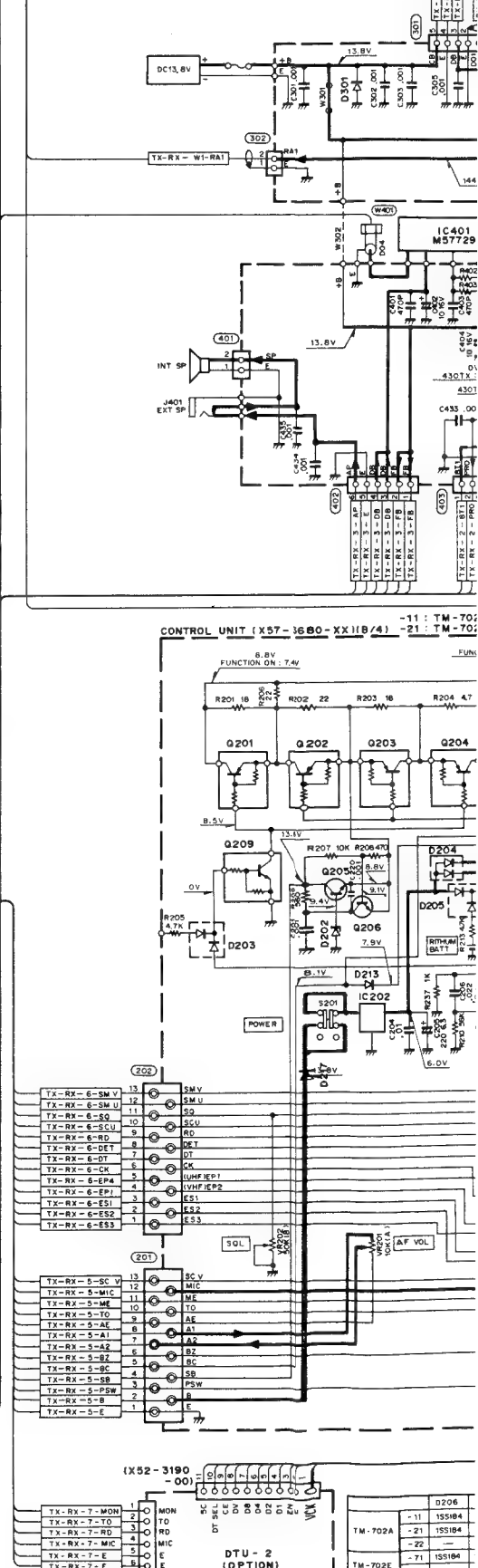




- |                      |                               |                       |                   |
|----------------------|-------------------------------|-----------------------|-------------------|
| IC3, 11 : KCD04      | Q1, 5, 7 : 3SK184 (S)         | Q16, 23 : 2SK208 (Y)  | D8 ~ 10 : 1SV128  |
| IC4 : TA7787AF       | Q2 : 3SK131 (L)               | Q18 : 2SB1302S        | D11 : 1SS268      |
| IC5 : KCC03          | Q3, 4, 8, 15 : DTC114EK       | Q28, 31 : 2SB1119 (S) | D12 ~ 14 : 1SS104 |
| IC6 : $\mu$ PC7080BH | 22, 25, 27, 30 : 2SA1162 (Y)  | Q34 : 2SA1162 (Y)     |                   |
| IC7 : LA5010M        | 32, 33 : 2SA1307 (Y)          | Q36 : 2SA1307 (Y)     |                   |
| IC8 : $\mu$ PC1241H  | Q6 : 2SK582                   | Q37 : 2SC1757 (K)     |                   |
| IC9 : KCB05          | Q21 : 2SC3120                 | Q39, 40 : 2SJ144      |                   |
| IC10 : KCB06         | Q12, 20, 24 : 2SC2714 (Y)     |                       |                   |
| IC12 : BU4053BF      | 38 : 2SC2712 (Y)              | D5, 6 : 1SV166        |                   |
|                      | Q14, 17, 19, 26 : 2SC2712 (Y) | D1 ~ 4, 15 : 1SV164   |                   |
|                      | 29, 35 : 2SK277               | D7 : HSK277           |                   |

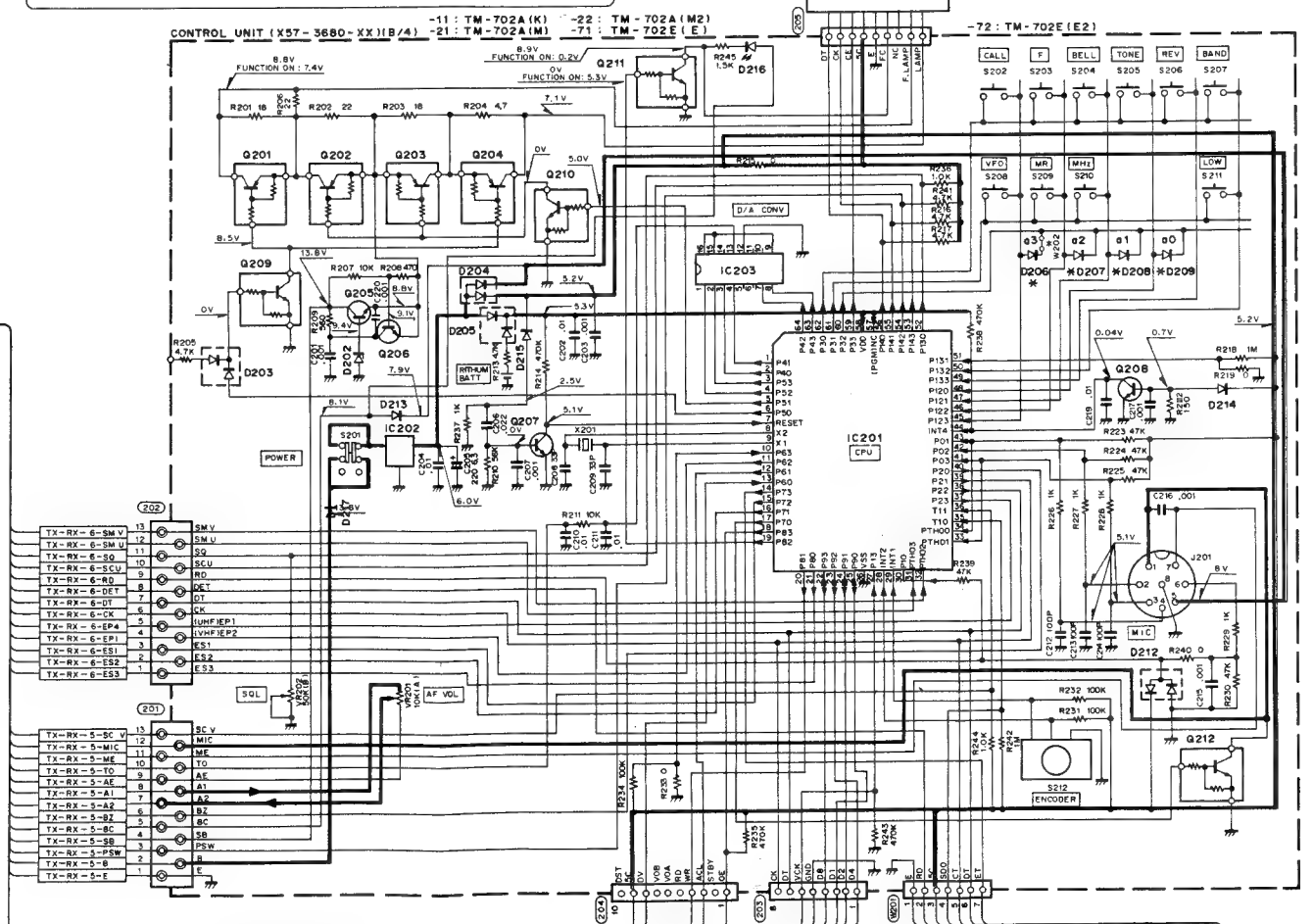
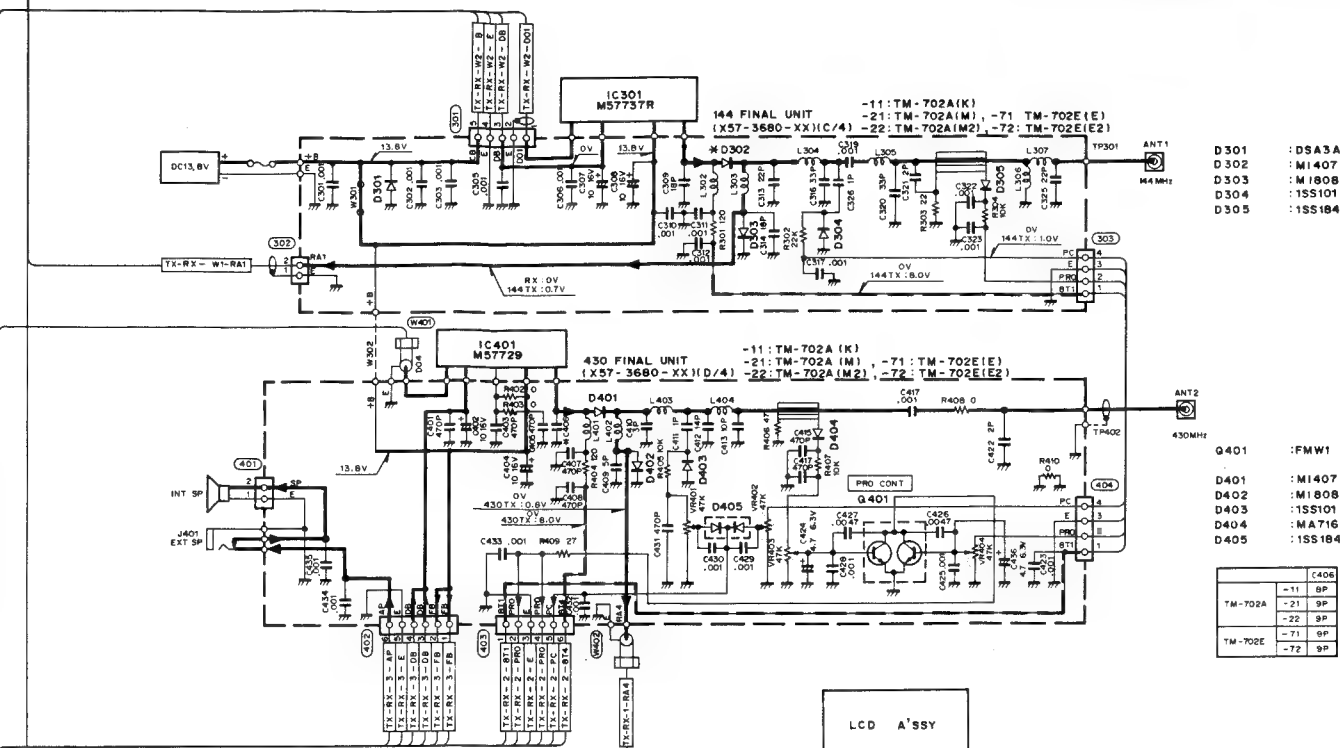
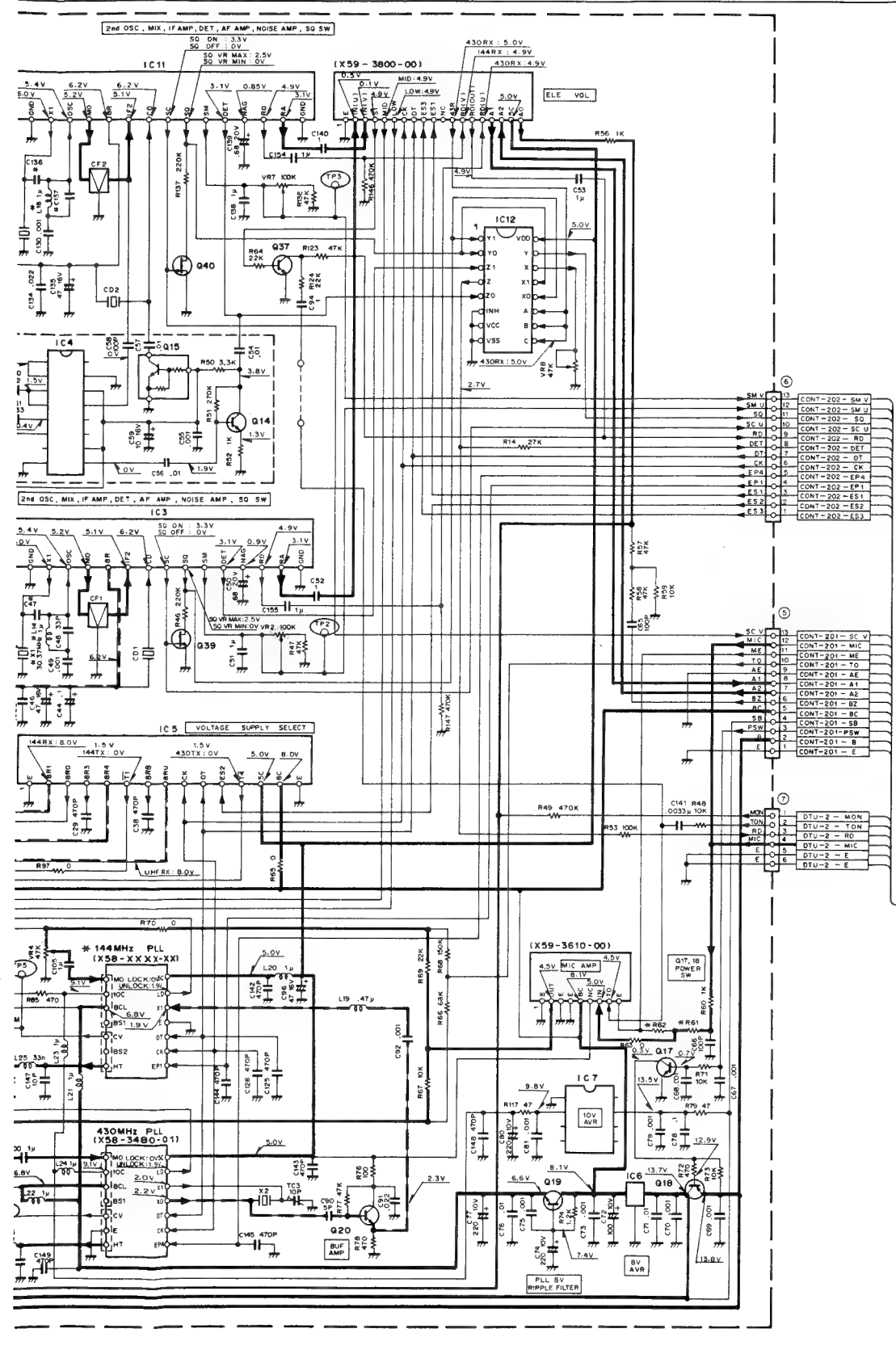
○ : USED, X : NOT USED

		D5	C35	C41	C47	C97	C99	C136	C137	C153	R12	R19	R61	R62	R128	R130	L5	L12	L13	L14	L17	L18	X1	X3	XF1	XF2	XA	XC	X58-XXXX-XX
TM-702A	-11	1SV164	3P	10P	68P	6P	4P	33P	56P	4P	27K	22	27K	47K	1.8K	1.8K	1056-0508	27K	X	4105	X	1253	1357	0252	0276	○	○	○	3670 - 11
	-21	1SV166	3P	12P	10P	6P	47P	39P	3P	X	47	27K	47K	0.1K	1.0K	4260-2157	39K	○	2157	○	1356	1444	0263	0294	X	X	X	3500 - 00	
	-71	1SV166	3P	12P	10P	6P	47P	39P	3P	X	47	0	6.8K	0	1.0K	4260-2157	39K	○	2157	○	1356	1444	0263	0294	X	X	X	3500 - 00	
TM-702E	-71	1SV166	3P	12P	10P	6P	47P	39P	3P	X	47	0	6.8K	0	1.0K	4260-2157	39K	○	2157	○	1356	1444	0263	0294	X	X	X	3500 - 00	
	-72	1SV166	3P	12P	10P	6P	47P	39P	3P	X	47	0	6.8K	0	1.0K	4260-2157	39K	○	2157	○	1356	1444	0263	0294	X	X	X	3500 - 00	





# SCHEMATIC DIAGRAM TM-702A/E



```
D301      : DSA3A1
D302      : MI407
D303      : M1808
D304      : 1SS101
D305      : 1SS184
```

Q401	:FMW1
D401	:MI407
D402	:MI808
D403	:1SS101
D404	:MA716
D405	:1SS184

		C406
TM-702A	-11	8P
	-21	9P
	-22	9P
TM-702E	-71	9P
	-72	9P

#1	#47	#97	#106	#136	#157	#158	#19	#61	#62	#129	#130	#131	#132	#133	#140	#147	#148	#1	#3	#7	#12	#18	#	#C	X08-XXX-XXX
♂	68P	68P	49P	33P	36P	27K	22	4.7	6.7K	1.8K	1.8K	0.95K	0.26K	27K	0	0.2157	0.253	0.335	0.252	0.27	0	0	0	3671	111
♂	12P	10P	6P	47P	39P	3P	X	4.7	2.7K	4.7K	0	1.0K	4.26K	0.2157	38P	0	0.2157	0.356	0.4444	0.263	0.294	X	X	3500	00
♂	12P	10P	6P	47P	39P	3P	X	4.7	2.7K	4.7K	0	1.0K	4.26K	0.2157	38P	0	0.2157	0.356	0.4444	0.263	0.294	X	X	3500	00
♂	12P	10P	6P	47P	39P	3P	X	4.7	0.68K	0	1.0K	4.26K	0.2157	38P	0	0.2157	0.356	0.4444	0.263	0.294	X	X	X	3500	00
♂	12P	10P	6P	47P	39P	3P	X	4.7	0.68K	0	1.0K	4.26K	0.2157	38P	0	0.2157	0.356	0.4444	0.263	0.294	X	X	X	3500	00

(X52-3190-001)

TX-RX-7-MON	MON
TX-RX-7-TO	TO
TX-RX-7-RD	RD
TX-RX-7-MIC	MIC
TX-RX-7-E	E
TX-RX-7-C	C

DTU-2 (OPTION)

		D206	D207	D208	D209	W202
TM - 702A	- 11	155104	—	155104	—	○
	- 21	155104	155104	155104	MA141A	○
	- 22	—	155104	155104	MA141A	○
TM - 702E	- 71	155104	155104	—	MA141A	○
	- 72	—	155104	—	MA141A	X

○ USED      X NOT USED

IC201 :75H6GF-667-3BE  
IC202 :NJM78L06UA  
IC203 :R90-0711-05

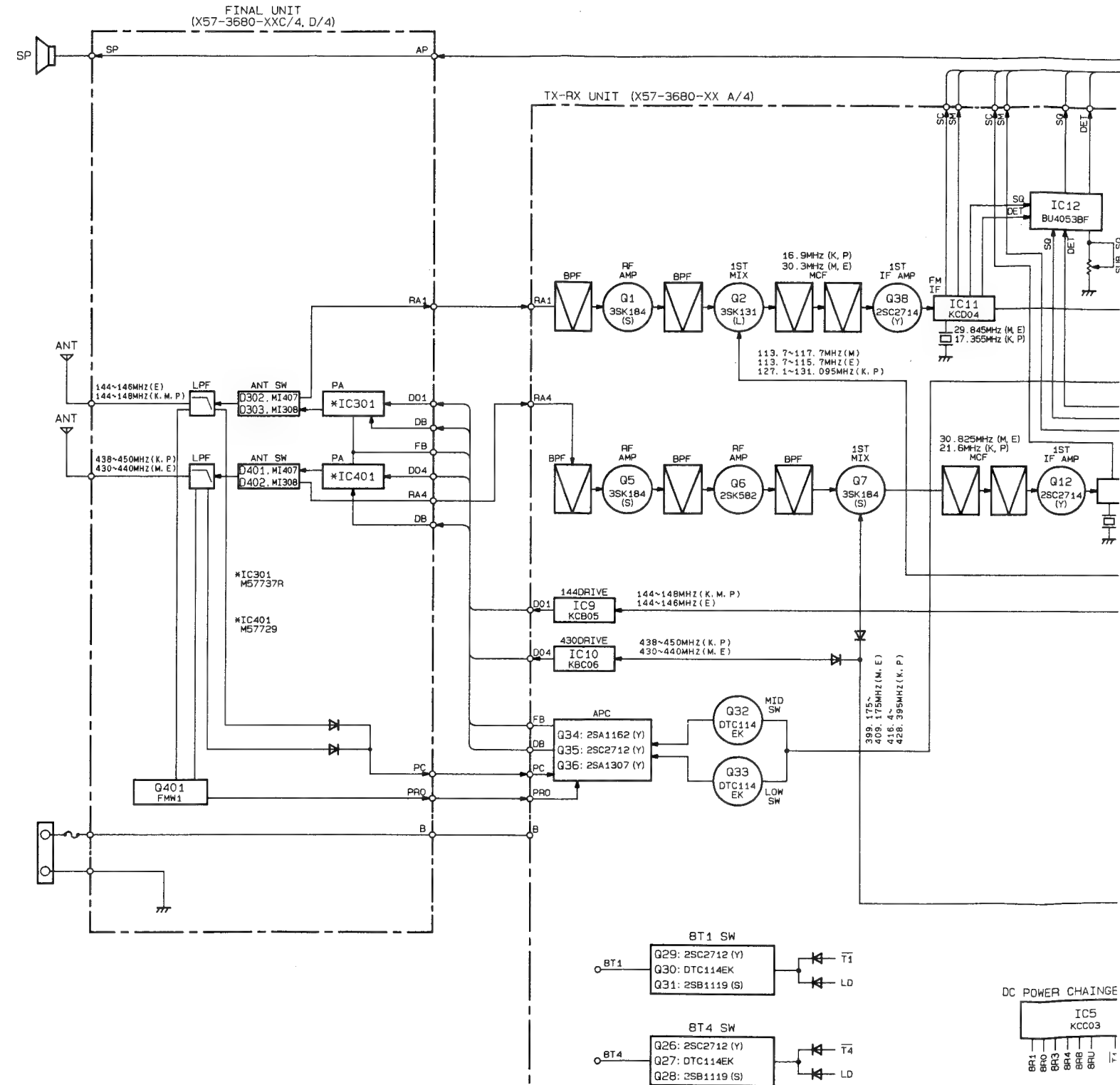
Q201~204 :2SA1519  
Q205 :2SD1682  
Q206~208 :2SC2712  
Q209,210 :DTC114EK  
212  
Q211 :DTD143EK

D202	:02CZ9.1Y
D203~205	:1S5184
206	
D204	:1S5181
D212	:1S5226
D213	:LF801
D214	:02CZ3.9(Z
D215	:02CZ3.0(Z
D216	:B30-0852
D217	:1S5184

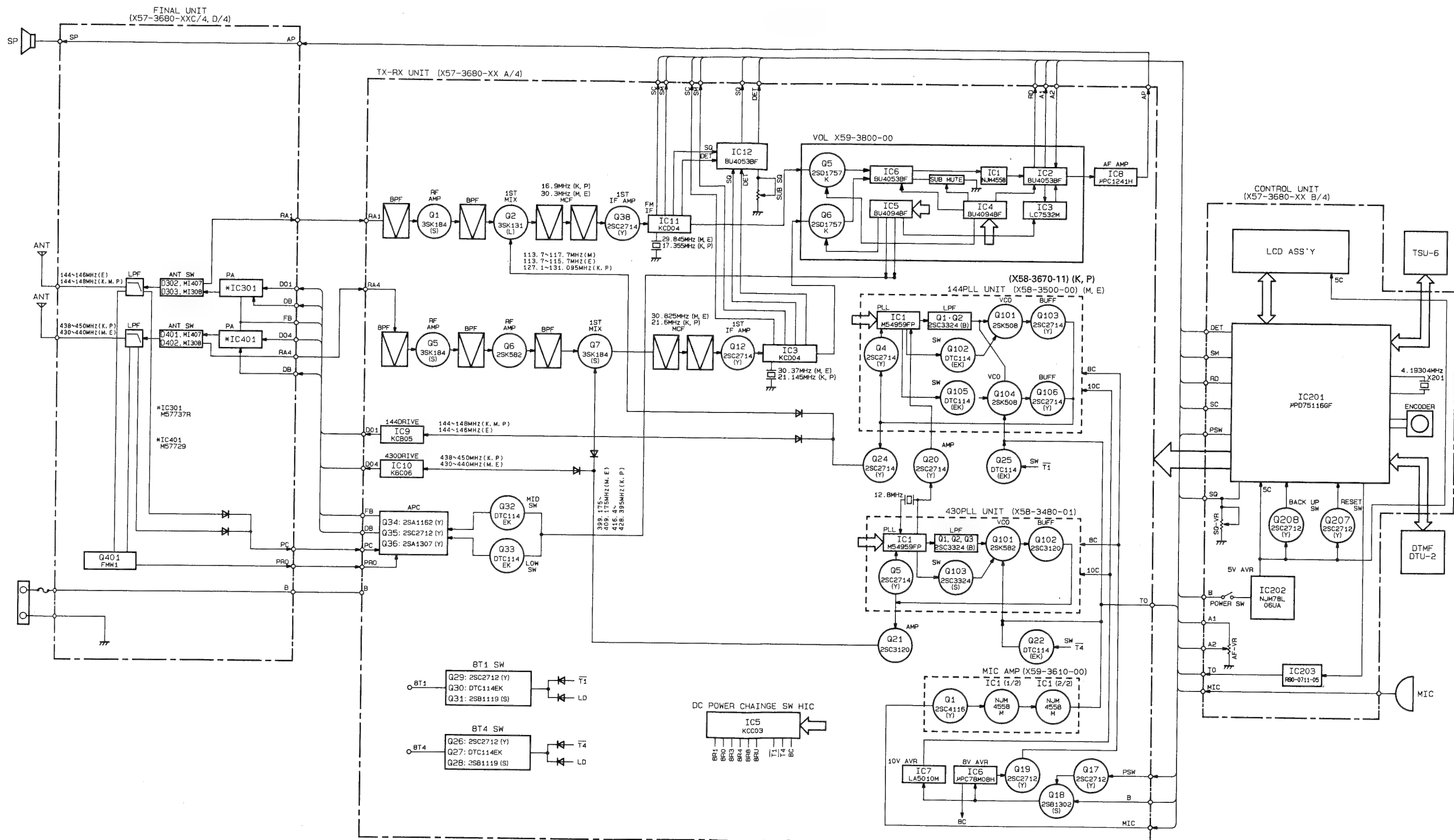
TSU - 6  
(OPTION)

Connector No.	Terminal No.	Terminal No.	Terminal Functions
<b>TX-RX UNIT (X57-3680-XX) (A/4)</b>			
CN1	1	RA4	430MHz ANT input
CN2	1	8T1	8V in transmit mode (144MHz)
	2	PRO	Protection
	3	E	GND
	4	PRO	Protection input
CN3	5	PC	APC input
	6	8T4	8V in transmit mode (430MHz)
CN3	1	AP	Audio output (from AF PA IC)
	2	E	GND
	3	DB	Drive + B
	4	DB	Drive + B
	5	FB	Final + B (13.8V)
	6	FB	Final + B (13.8V)
CN4	1	DO4	430MHz drive output
CN5	1	E	GND
	2	B	+ 13.8V
	3	PSW	Power switch control output (from microprocessor)
	4	SB	SWICHED B
	5	8C	Common + 8V
	6	BZ	Beeper output (from microprocessor)
	7	A2	AF output (from AF VOL)
	8	A1	AF output (from electronic VOL)
	9	AE	GND
	10	TO	Tone output (from ladder resister network IC IC203)
	11	ME	MIC GND
	12	MIC	MIC output
	13	SCV	Busy control output (from IC11 KCD04)
CN6	1	ES3	Shift register enable
	2	ES2	Shift register enable (from microprocessor)
	3	ES1	Shift register enable (from microprocessor)
	4	EP1	144MHz shift register enable (to 144MHz PLL)
	5	EP4	430MHz shift register enable (to 430MHz PLL)
	6	CK	PLL clock
	7	DT	PLL data
	8	DET	DETECTOR OUT for CTCSS
	9	RD	Audio output (from IC3 KCD04)
	10	SCU	Busy control output (from IC3 KCD04)
	11	SQ	Squelch output (from IC3 KCD04)
	12	SMU	S-meter output (from IC3 KCD04)
	13	SMV	S-meter output (from IC11 KCD04)
W1	1	E	GND
W1	2	RA1	144MHz receive ANT input
	3	DO1	144MHz transmit drive output
M2	1	DO1	GND
	2	B	Drive + B
	3	DB	Drive + B
	4	E	GND
M2	5	B	13.8V
	6	B	13.8V
<b>CONTROL UNIT (X57-3680-XX) (B/4)</b>			
CN201	1	E	GND
	2	B	+ 13.8V (to power switch)
	3	PSW	Power switch control output (from microprocessor IC)
	4	SB	SWICHED B
	5	8C	Common +8V
	6	BZ	Beeper output (from microprocessor P20)
	7	A2	Audio output (from electronic VOL)
	8	A1	Audio input (from electronic VOL)
	9	AE	GND (AF VOL)
	10	TO	Tone output (from ladder register network IC203)
	11	ME	MIC GND
	12	MIC	MIC output (from mic jack)
	13	SCV	Busycontrol output (from IC11 KCD04)
CN202	1	ES3	Shift register enable output
	2	ES2	Shift register enable output
	3	ES1	Shift register enable output
	4	EP1	144MHz PLL enable output
	5	EP4	430MHz PLL enable output
	6	CK	PLL clock
	7	DT	PLL data
	8	DE	Detector output for CTCSS
	9	RD	Audio output (to microprocessor INT0)
	10	SCU	Busy control output (to microprocessor P130)
	11	SQ	Squelch output
	12	SMU	S-meter output (to microprocessor PTH03)
	13	SMV	S-meter output (to microprocessor PTH02)

Connector No.	Terminal No.	Terminal No.	Terminal Functions
CN203	1	CE	LCD driver enable output (from microprocessor P33)
	2	DT	LCD driver data (from microprocessor P140)
	3	CK	LCD driver clock (from microprocessor P141)
CN204	1	OE	EN DTMF enable output
	2	STBY	NC
	3	ACL	CE DTMF decoder CE
	4	WR	DTSEL
	5	RD	
	6	VOA	
	7	VOB	
	8	DV	DTMF detected signal input
	9	5C	+5V
	10	DST	
CN205	1	DT	LCD driver DATA output
	2	CK	LCD driver clock output
	3	CE	LCD driver enable output
	4	5C	+ 5V
	5	E	GND
	6	FC	Function Control
	7	NC	
	8	F.LAMP	Function lamp B
	9	LAMP	Lamp B
W201	1	ET	CTCSS unit enable output (from microprocessor P73)
	2	DT	CTCSS unit data output (from microprocessor P22)
	3	CT	CTCSS unit clock output (from microprocessor P21)
	4	SDD	CTCSS tone matching input
	5	5C	+5V
	6	RD	Audio demodulation output (to CTCSS unit)
	7	E	GND
<b>144 FINAL UNIT (X57-3680-XX) (C/4)</b>			
CN301	1	DO1	144MHz transmit drive output
	2	E	GND
	3	DB	Transmit drive stage + B
	4	E	GND
	5	B	13.8V
CN302	1	E	GND
	2	PA1	144MHz receiver ANT input
CN302	3	+ B	13.8V (from fuse holder)
	4	E	GND
<b>430FINAL UNIT (X57-3680-XX) (D/4)</b>			
CN401	1	SP	Speaker output (to speaker)
	2	E	GND
CN402	1	FB	+ 13.8V
	2	FB	+ 13.8V
	3	DB	Module transmit drive stage + B
	4	DB	Module transmit drive stage + B
	5	E	GND
	6	AP	AP output (to EXT SP jack)
CN403	1	8T1	+ 8V in transmit mode (430MHz)
	2	PRO	Protection input (from final unit)
	3	E	GND
	4	PRO	Protection input
	5	PC	APC input
	6	8T4	+ 8V in transmit mode (430MHz)
CN404	1	8T1	+8V in tranmit mode (144MHz) (to 144final unit)
	2	PRO	Protection input (from dinal unit)
	3	E	GND
	4	PC	APC input (from 144 final unit)
J401			EXT. SP jack
TP401		ANT2	ANT connector
		E	GND
W401		DO4	430MHz drive output
		E	GND
W402		RA4	430MHz receive ANT output
		E	GND
W302		+B	+13.8V



BLOCK DIAGRAM



receiver section

1. SG input level for which 12dB SINAD is obtained. Measured by connecting the SG to each point via a 0.01 $\mu$ F capacitor.
2. Af level obtained when the AF output level is adjusted for 0.63V/8W with the front panel AF VOL control. Measured with AF voltmeter connected to the external speaker jack, receiving a 40dB EMF SSG signal modulated at 1kHz, DEV 3kHz.

# Transmitter section

The schematic diagram illustrates the transmitter section of a radio, divided into three main functional areas: TX-RX UNIT (CONTROL), TX-RX UNIT (TX-RX), and TX-RX UNIT (144 FINAL) and TX-RX UNIT (430 FINAL).

**TX-RX UNIT (CONTROL):** This section starts with a MIC input (3mV) connected to a microphone symbol. The signal path includes two ICs (IC1, IC2) and a variable resistor VR4. The output of this section is connected to the TX-RX UNIT (TX-RX).

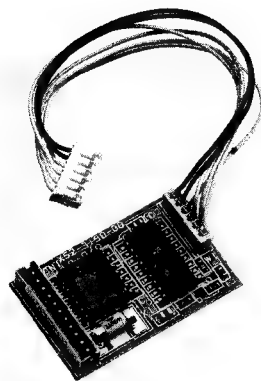
**TX-RX UNIT (TX-RX):** This section contains the main processing stages. It includes a 144 PLL (X58-3500-00) (M, E) and a 430 PLL (X58-3670-11) (K, P). The signal path involves several transistors (Q1, Q2, Q3, Q4, Q5, Q6, Q7, Q8, Q9, Q10, Q11, Q12, Q13, Q14, Q15, Q16, Q17, Q18, Q19, Q20, Q21, Q22, Q23, Q24, Q25, Q26, Q27, Q28, Q29, Q30, Q31, Q32, Q33, Q34, Q35, Q36, Q37, Q38, Q39, Q40, Q41, Q42, Q43, Q44, Q45, Q46, Q47, Q48, Q49, Q50, Q51, Q52, Q53, Q54, Q55, Q56, Q57, Q58, Q59, Q60, Q61, Q62, Q63, Q64, Q65, Q66, Q67, Q68, Q69, Q70, Q71, Q72, Q73, Q74, Q75, Q76, Q77, Q78, Q79, Q80, Q81, Q82, Q83, Q84, Q85, Q86, Q87, Q88, Q89, Q90, Q91, Q92, Q93, Q94, Q95, Q96, Q97, Q98, Q99, Q100, Q101, Q102, Q103, Q104, Q105, Q106, Q107, Q108, Q109, Q110, Q111, Q112, Q113, Q114, Q115, Q116, Q117, Q118, Q119, Q120, Q121, Q122, Q123, Q124, Q125, Q126, Q127, Q128, Q129, Q130, Q131, Q132, Q133, Q134, Q135, Q136, Q137, Q138, Q139, Q140, Q141, Q142, Q143, Q144, Q145, Q146, Q147, Q148, Q149, Q150, Q151, Q152, Q153, Q154, Q155, Q156, Q157, Q158, Q159, Q160, Q161, Q162, Q163, Q164, Q165, Q166, Q167, Q168, Q169, Q170, Q171, Q172, Q173, Q174, Q175, Q176, Q177, Q178, Q179, Q180, Q181, Q182, Q183, Q184, Q185, Q186, Q187, Q188, Q189, Q190, Q191, Q192, Q193, Q194, Q195, Q196, Q197, Q198, Q199, Q200, Q201, Q202, Q203, Q204, Q205, Q206, Q207, Q208, Q209, Q210, Q211, Q212, Q213, Q214, Q215, Q216, Q217, Q218, Q219, Q220, Q221, Q222, Q223, Q224, Q225, Q226, Q227, Q228, Q229, Q230, Q231, Q232, Q233, Q234, Q235, Q236, Q237, Q238, Q239, Q240, Q241, Q242, Q243, Q244, Q245, Q246, Q247, Q248, Q249, Q250, Q251, Q252, Q253, Q254, Q255, Q256, Q257, Q258, Q259, Q260, Q261, Q262, Q263, Q264, Q265, Q266, Q267, Q268, Q269, Q270, Q271, Q272, Q273, Q274, Q275, Q276, Q277, Q278, Q279, Q280, Q281, Q282, Q283, Q284, Q285, Q286, Q287, Q288, Q289, Q290, Q291, Q292, Q293, Q294, Q295, Q296, Q297, Q298, Q299, Q300, Q301, Q302, Q303, Q304, Q305, Q306, Q307, Q308, Q309, Q310, Q311, Q312, Q313, Q314, Q315, Q316, Q317, Q318, Q319, Q320, Q321, Q322, Q323, Q324, Q325, Q326, Q327, Q328, Q329, Q330, Q331, Q332, Q333, Q334, Q335, Q336, Q337, Q338, Q339, Q340, Q341, Q342, Q343, Q344, Q345, Q346, Q347, Q348, Q349, Q350, Q351, Q352, Q353, Q354, Q355, Q356, Q357, Q358, Q359, Q360, Q361, Q362, Q363, Q364, Q365, Q366, Q367, Q368, Q369, Q370, Q371, Q372, Q373, Q374, Q375, Q376, Q377, Q378, Q379, Q380, Q381, Q382, Q383, Q384, Q385, Q386, Q387, Q388, Q389, Q390, Q391, Q392, Q393, Q394, Q395, Q396, Q397, Q398, Q399, Q400, Q401, Q402, Q403, Q404, Q405, Q406, Q407, Q408, Q409, Q410, Q411, Q412, Q413, Q414, Q415, Q416, Q417, Q418, Q419, Q420, Q421, Q422, Q423, Q424, Q425, Q426, Q427, Q428, Q429, Q430, Q431, Q432, Q433, Q434, Q435, Q436, Q437, Q438, Q439, Q440, Q441, Q442, Q443, Q444, Q445, Q446, Q447, Q448, Q449, Q450, Q451, Q452, Q453, Q454, Q455, Q456, Q457, Q458, Q459, Q460, Q461, Q462, Q463, Q464, Q465, Q466, Q467, Q468, Q469, Q470, Q471, Q472, Q473, Q474, Q475, Q476, Q477, Q478, Q479, Q480, Q481, Q482, Q483, Q484, Q485, Q486, Q487, Q488, Q489, Q490, Q491, Q492, Q493, Q494, Q495, Q496, Q497, Q498, Q499, Q500, Q501, Q502, Q503, Q504, Q505, Q506, Q507, Q508, Q509, Q510, Q511, Q512, Q513, Q514, Q515, Q516, Q517, Q518, Q519, Q520, Q521, Q522, Q523, Q524, Q525, Q526, Q527, Q528, Q529, Q530, Q531, Q532, Q533, Q534, Q535, Q536, Q537, Q538, Q539, Q540, Q541, Q542, Q543, Q544, Q545, Q546, Q547, Q548, Q549, Q550, Q551, Q552, Q553, Q554, Q555, Q556, Q557, Q558, Q559, Q560, Q561, Q562, Q563, Q564, Q565, Q566, Q567, Q568, Q569, Q570, Q571, Q572, Q573, Q574, Q575, Q576, Q577, Q578, Q579, Q580, Q581, Q582, Q583, Q584, Q585, Q586, Q587, Q588, Q589, Q590, Q591, Q592, Q593, Q594, Q595, Q596, Q597, Q598, Q599, Q600, Q601, Q602, Q603, Q604, Q605, Q606, Q607, Q608, Q609, Q610, Q611, Q612, Q613, Q614, Q615, Q616, Q617, Q618, Q619, Q620, Q621, Q622, Q623, Q624, Q625, Q626, Q627, Q628, Q629, Q630, Q631, Q632, Q633, Q634, Q635, Q636, Q637, Q638, Q639, Q640, Q641, Q642, Q643, Q644, Q645, Q646, Q647, Q648, Q649, Q650, Q651, Q652, Q653, Q654, Q655, Q656, Q657, Q658, Q659, Q660, Q661, Q662, Q663, Q664, Q665, Q666, Q667, Q668, Q669, Q670, Q671, Q672, Q673, Q674, Q675, Q676, Q677, Q678, Q679, Q680, Q681, Q682, Q683, Q684, Q685, Q686, Q687, Q688, Q689, Q690, Q691, Q692, Q693, Q694, Q695, Q696, Q697, Q698, Q699, Q700, Q701, Q702, Q703, Q704, Q705, Q706, Q707, Q708, Q709, Q710, Q711, Q712, Q713, Q714, Q715, Q716, Q717, Q718, Q719, Q720, Q721, Q722, Q723, Q724, Q725, Q726, Q727, Q728, Q729, Q730, Q731, Q732, Q733, Q734, Q735, Q736, Q737, Q738, Q739, Q740, Q741, Q742, Q743, Q744, Q745, Q746, Q747, Q748, Q749, Q750, Q751, Q752, Q753, Q754, Q755, Q756, Q757, Q758, Q759, Q760, Q761, Q762, Q763, Q764, Q765, Q766, Q767, Q768, Q769, Q770, Q771, Q772, Q773, Q774, Q775, Q776, Q777, Q778, Q779, Q780, Q781, Q782, Q783, Q784, Q785, Q786, Q787, Q788

1. AG is set so that MIC input becomes 3kHz DEV at 1kHz MOD.
2. Transmitting frequency : 145.06 MHz

# TM-702A/E

## DTU-2 (DTMF UNIT)

### DTU-2 EXTERNAL VIEW



### DUT-2 PARTS LIST

\* NEW PARTS

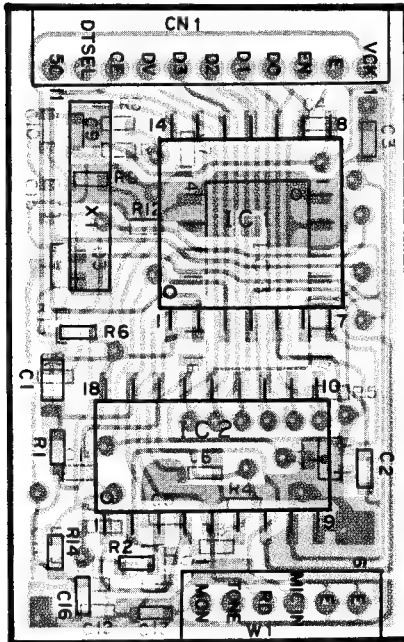
Ref. No.	New parts	Parts No.	Description
C1		CK73FB1E104K	Chip C 0.1μF K
C2		CC73GCH1H100D	Chip C 10pF D
C3, 4		CC73GCH1H330J	Chip C 33pF J
C5~8, 10		CK73GB1E103K	Chip C 0.01μF K
C13~16		CK73GB1E103K	Chip C 0.01μF K
C9		CK73GB1E822K	Chip C 0.0082μF K
C10		CK73GB1E322K	Chip C 0.0033μF K
C11		CC73GSL1H101J	Chip C 100pF J
	*	E37-0033-05	Connecting cable (6P)
	*	E40-5188-05	Pin ass'y socket (11P)
X1		L78-0061-05	CERAMIC RESONATOR (3.58MHz)
R1~14		RK73GB1JxxxJ	Chip R
Q1		DTC114EU	Digital transistor
Q2, 3		2SC4116 (Y)	Digital transistor
IC1		TP5088WM	IC
IC2	*	LC7385M	IC
IC3	*	BU4066BF	IC



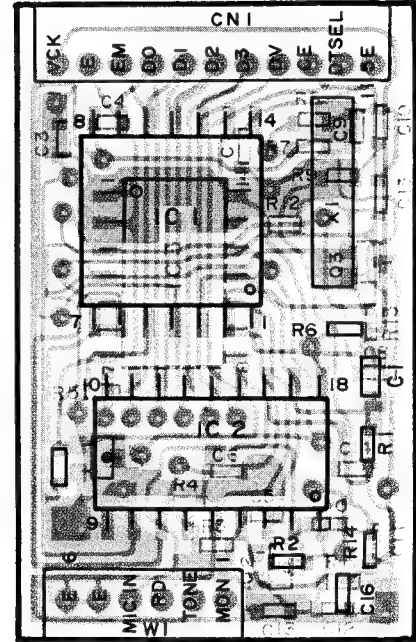
## DTU-2 (DTMF UNIT)

### DTU-2 PC BOARD VIEWS

Component side view

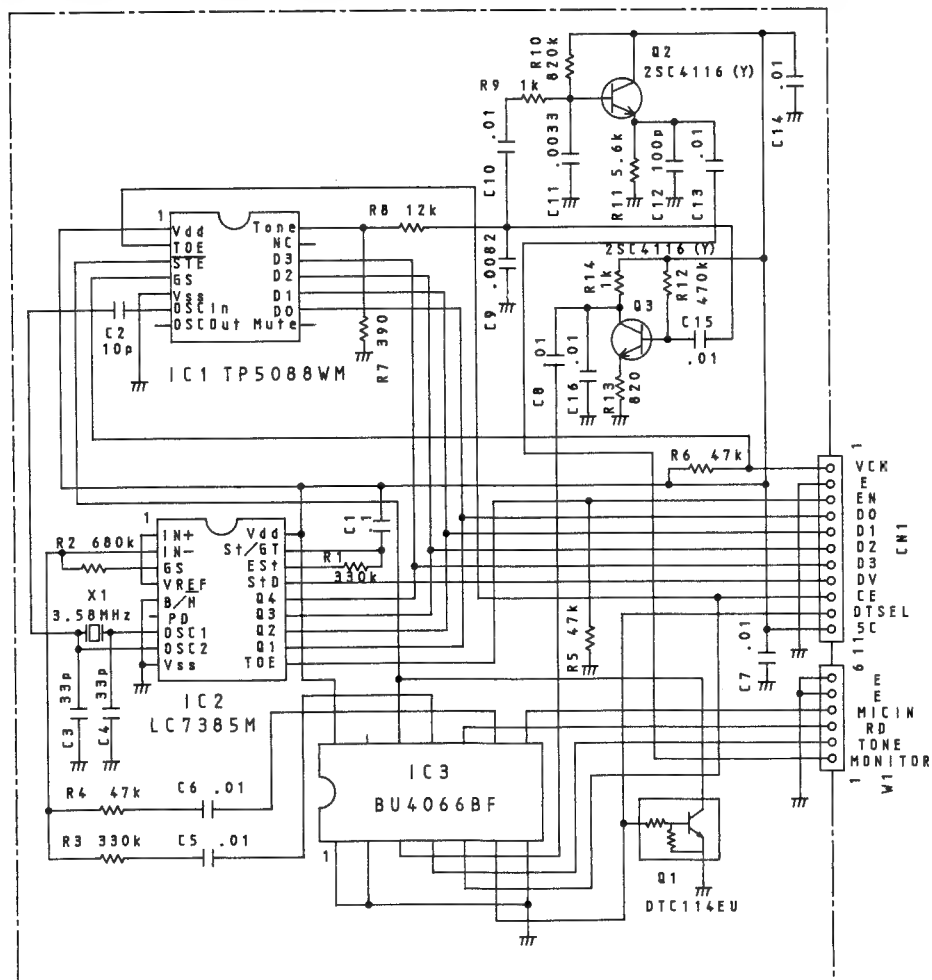


Foil side view



Component side  
Foil side

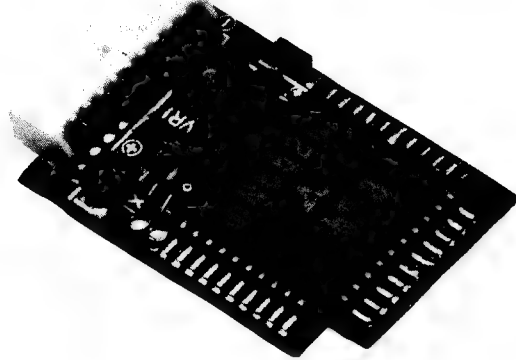
### DTU-2 CIRCUIT DIAGRAM



# TM-702A/E

## TSU-6 (CTCSS UNIT)

### TSU-6 EXTERNAL VIEW



### TSU-6 REFERENCE DATA

TH-25's condition and MN4094BS (IC2) relationship

Ref. No	Tone switch	TX/RX	MIN4094BS terminal		
			Q5	Q6	Q1 ~ 4, 7, 8
OFF	OFF	TX	L	H	L
		RX	L	H	L
	ON	TX	L	L	See table 2
		RX	L	H	L
ON	OFF	TX	L	L	See table 2
		RX	H	L	
	On	TX	L	L	
		RX	H	L	

Q1 ~ 4, 7, 8 : Tone frequency setting

Q5 : TX/RX switch for MN6520 (IC1). "H" : RX, "L" : TX.

Q6 : Power switch for MN6520 (IC1). "H" : OFF, "L" : ON.

Table 1

### TSU-6 PARTS LIST

\* New parts

Ref. No.	New Parts	Parts No.	Description
CTCSS UNIT (X52-3100-00)			
C1		CK73FB1H102K	Chip C 1000pF K
C2		C92-0010-05	Tantal 6.8μF 6.3WV
C3	*	C92-0006-05	Tantal 3.3μF 4.0WV
C4, 5		CK73EB1E104K	Chip C 0.1μF K
C6		CK73EB1H223K	Chip C 0.022μF K
C7		CK73EB1E104K	Chip C 0.1μF K
C8,9		CC73FCH1H150J	Chip C 15pF J
C10		CC73EB1H102K	Chip C 1000pF K
C11		CK73EB1E104K	Chip C 0.1μF K
C12		C92-0507-05	Chip tan. 4.7μF 6.3WV
C13	*	C92-0510-05	Chip tan. 3.3μF 4.0WV
	*	E40-5121-05	Pin connector (10P)
X1		L77-1313-05	X'tal resonator 4.194304MHz
R1-10		RK73FB2 000J	Chip resistor
R12-14		RK73FB2 000J	Chip resistor
VR1	*	R12-3460-05	Trimming pot. 33kΩ
Q1		DTC144TK	Digital transistor
Q2		DTA114EK	Digital transistor
Q3		2SC2712(GR)	Chip transistor
IC1		MN6520	IC
IC2		MN4094BS	IC

### TSU-6 FINE ADJUSTMENT OF TONE FREQUENCY

The tone frequency can be fine adjusted with an interval of 0.5% step over the range of 0 to + 1.5%. Ground the T1 (pin 10) and T2 (pin 9) of IC1 to obtain the desired frequency.

	T1	T2
0%	×	×
+0.5%	○	×
+1.0%	×	○
+1.5%	○	○

○ : GND, × : OPEN

Table 3

### Tone frequency and MN6520 (IC1) relationship

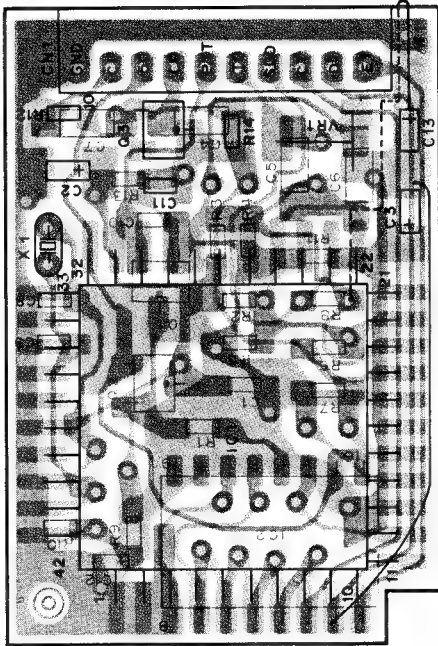
Tone frequency (Hz)	MN6520 terminal					
	S6	S5	S4	S3	S2	S1
	MN4094BS terminal					
	Q1	Q2	Q3	Q4	Q7	Q8
67.0	L	H	H	H	L	H
71.9	L	H	H	H	L	L
74.4	L	H	H	L	H	H
77.0	L	H	H	L	H	L
79.7	L	H	H	L	L	H
82.5	L	H	H	L	L	L
85.4	L	H	L	H	H	H
88.5	L	H	L	H	H	L
91.5	L	H	L	H	L	H
94.8	H	H	H	L	L	H
100.0	H	H	H	L	L	L
103.5	H	H	L	H	H	H
107.2	H	H	L	H	H	L
110.9	H	H	L	H	L	H
114.8	H	H	L	H	L	L
118.8	H	H	L	L	H	H
123.0	H	H	L	L	H	L
127.3	H	H	L	L	L	H
131.8	H	H	L	L	L	L
136.5	H	L	H	H	H	H
141.3	H	L	H	H	H	L
146.2	H	L	H	H	L	H
151.4	H	L	H	H	L	L
156.7	H	L	H	L	H	H
162.2	H	L	H	L	H	L
167.9	H	L	H	L	L	H
173.8	H	L	H	L	L	L
179.9	H	L	L	H	H	H
186.2	H	L	L	H	H	L
192.8	H	L	L	H	L	H
203.5	H	L	L	H	L	L
210.7	H	L	L	L	H	H
218.1	H	L	L	L	H	L
225.7	H	L	L	L	L	H
233.6	H	L	L	L	L	L
241.8	L	H	H	H	H	H
250.3	L	H	H	H	H	L

Table 2

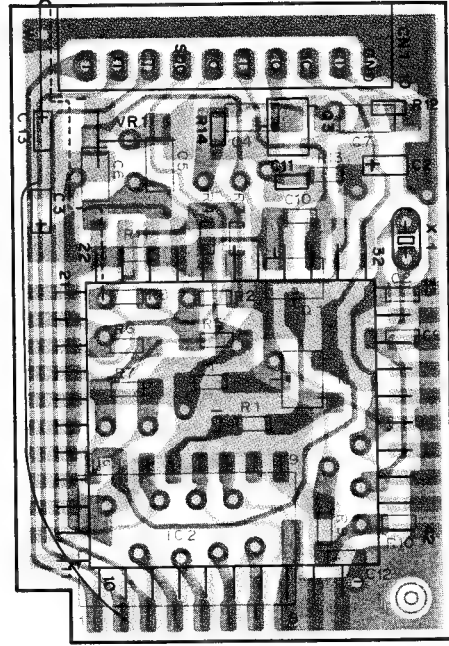
## TSU-6 (CTCSS UNIT)

### TSU-6 PC BOARD VIEWS

Component side view

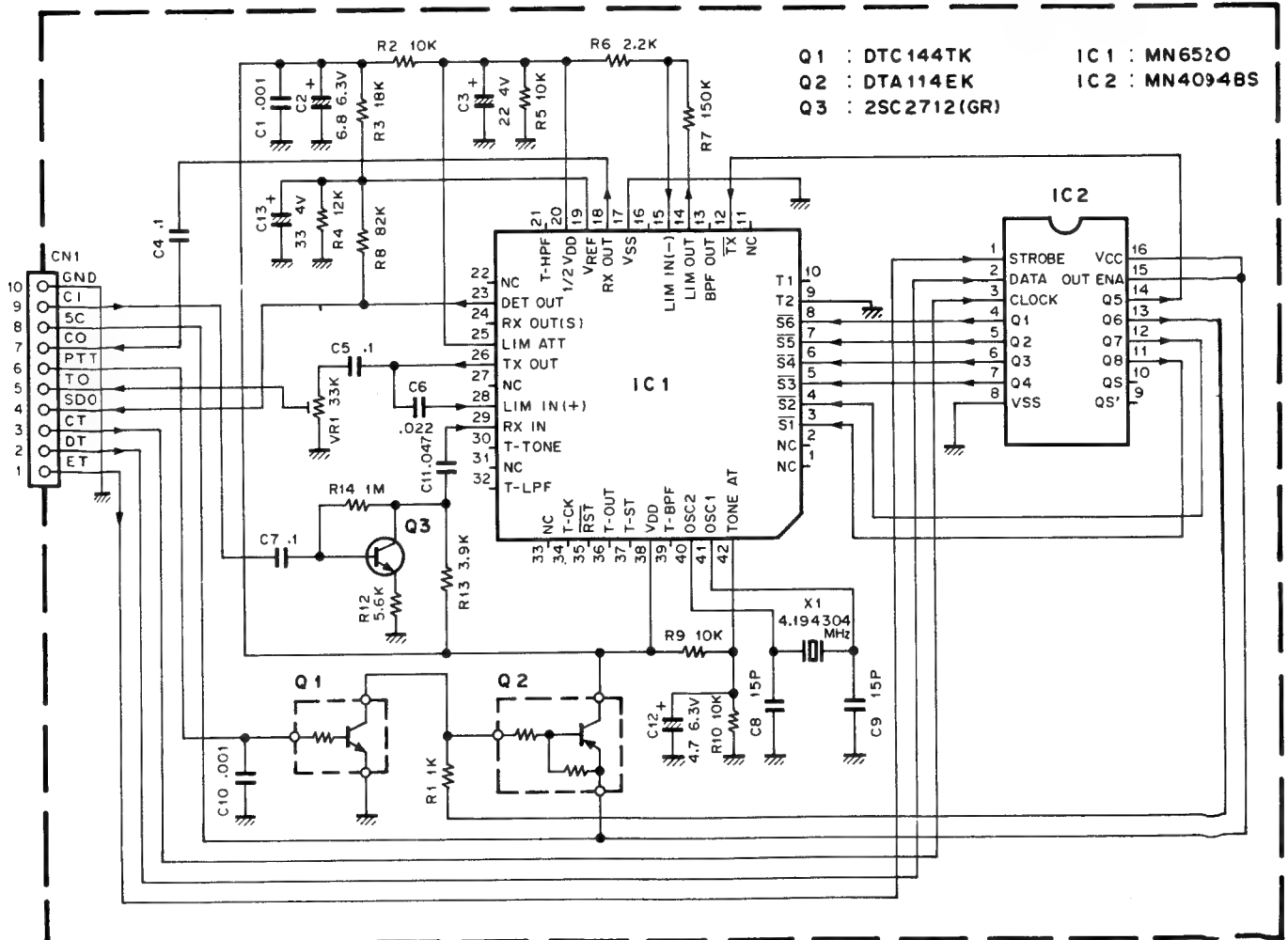


Foil side view



○ : Component side  
■ : Foil side

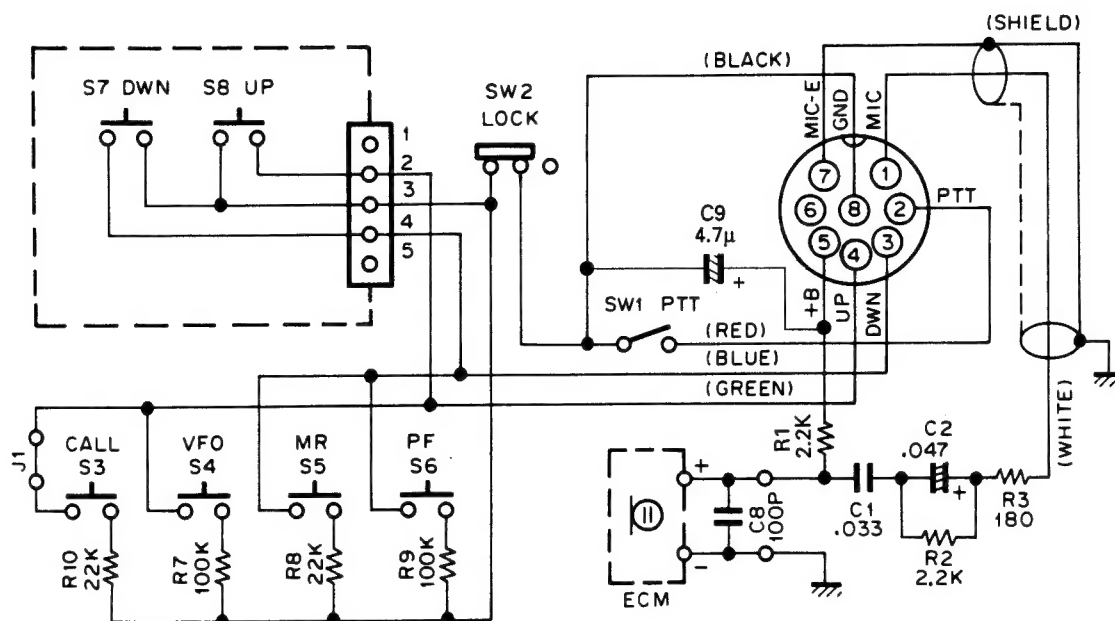
### TSU-6 CIRCUIT DIAGRAM CTCSS UNIT (X52-3100-00)



# TM-702A/E

## MC-44 (MULTI FUNCTION MICROPHONE)

MC-4 SCHEMATIC DIAGRAM

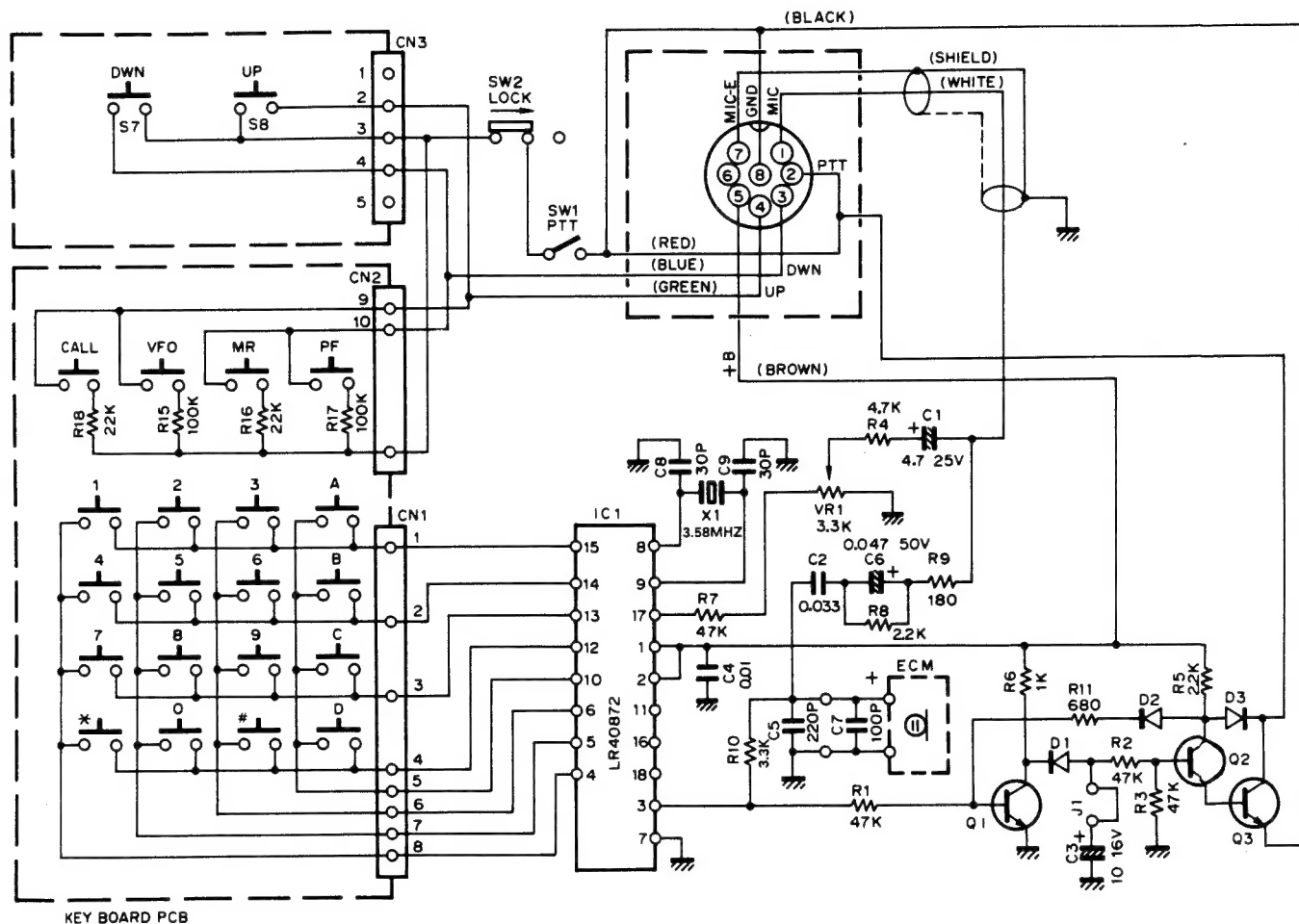


MC-44 PARTS LIST

Ref. No.	New parts	Parts No.	Description
	*	A02-0896-18	Case (Front)
		A02-0900-08	Case (Rear)
	*	B50-8293-18	Instruction manual
		E30-2149-08	Curt cord
	*	E13-0933-08	Cushion
	*	K29-3156-08	Knob PTT
	*	K29-3168-18	Knob UP
	*	K29-3169-18	Knob DOWN
		K29-3170-08	Knob CLL, VFO, MR, PF
SW2		S31-1422-08	Slide switch LOCK
SW1		S50-1431-08	Micro switch PTT
S7, 8	*	S59-1409-28	Switch Ass'y UP, DOWN
		T91-0383-08	Microphone element (Condenser microphone)

## MC-44DM/44DEM (MULTI FUNCTION MICROPHONE WITH AUTOPATCH)

MC-44DM/MC-44DME SCHEMATIC DIAGRAM



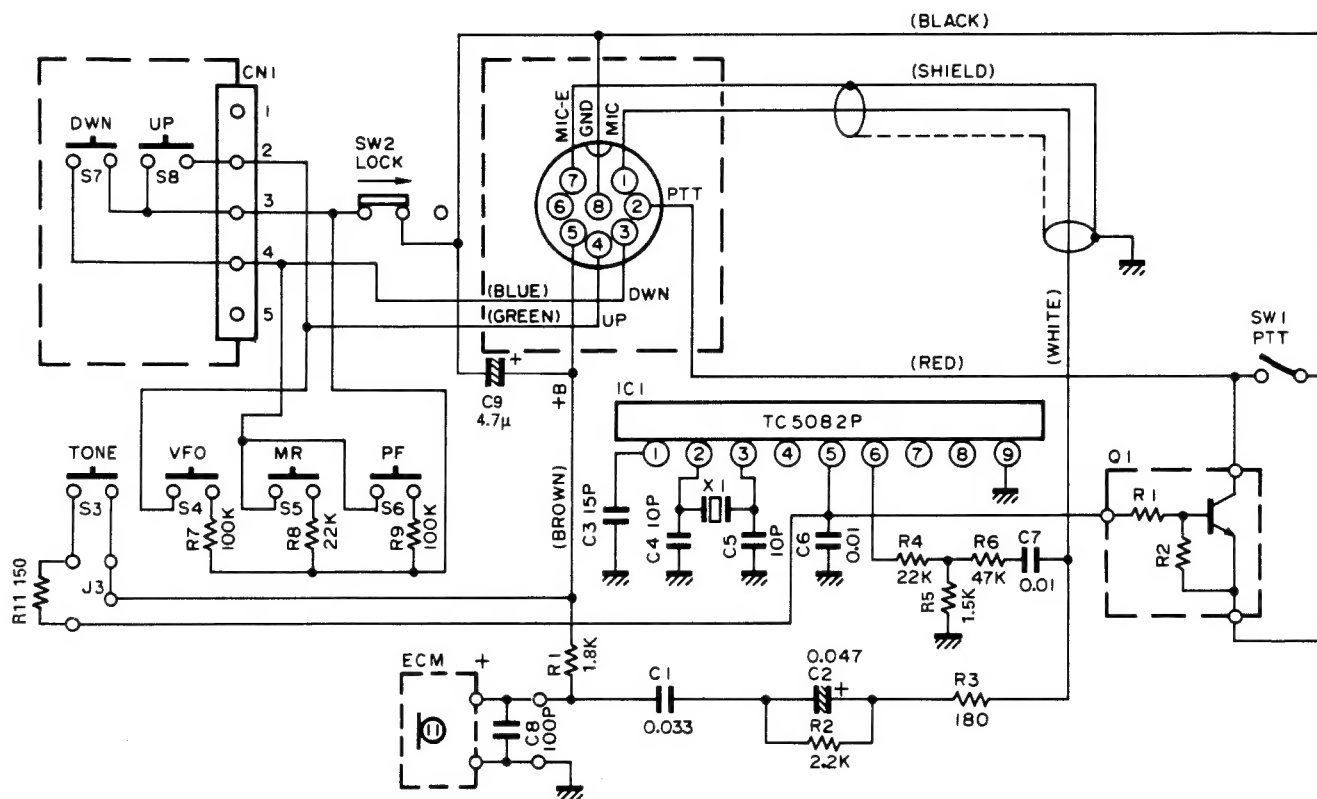
MC-44DM/MC-44DME PARTS LIST

Ref. No.	New parts	Parts No.	Description
	*	A02-0898-18	Case (Front) DTMF M
	*	A20-0899-18	Case (Front) DTMF (With TONE) E
		A02-0901-08	Case (Rear) DTMF
	*	B50-8293-18	Instruction manual
		E30-2149-08	Curt cord
	*	E13-0933-08	Cushion
		K29-3165-08	Knob PTT
		K29-3167-08	Key top DTMF
	*	K29-3168-18	Knob UP
	*	K29-3169-18	Knob DOWN
SW2		S31-1422-08	Slide switch LOCK
SW1		S50-1431-08	Micro switch PTT
S7, 8	*	S59-1409-28	Switch Ass'y UP, DOWN
		T91-0383-08	Microphone element (Condenser microphone)

# TM-702A/E

## MC-44E (MULTI FUNCTION MICROPHONE)

MC-44E SCHEMATIC DIAGRAM



MC-44E PARTS LIST

Ref. No.	New parts	Parts No.	Description
	*	A02-0897-18	Case (Front) With TONE
		A02-0900-08	Case (Rear)
	*	B50-8293-18	Instruction manual
		E30-2149-08	Curt cord
	*	G13-0933-08	Cushion
	*	K29-3165-08	Knob PTT
	*	K29-3168-18	Knob UP
	*	K29-3169-18	Knob DOWN
	*	K29-3170-08	Knob 1750, VFO, MR, PF
SW2		S31-1422-08	Slide switch LOCK
SW1		S50-1431-08	Micro switch PTT
S7, 8	*	S59-1409-28	Switch Ass'y UP, DOWN
	*	T91-0383-08	Microphone element (Condenser microphone)

# TM-702A/E

## SPECIFICATIONS

			TM-702A		TM-702E
GENERAL	Frequency range (MHz)		144 to 148 / 438 to 450 K. P TYPE	144 to 148 / 430 to 440 M. M2 TYPE	144 to 146 / 430 to 440 E. E2 TYPE
	Mode		F3E (FM)		
	Antenna impedance		50Ω		
	Operating temperature		-20°C to +60°C (-4°F to +140°F)		
	Power requirements		13.8VDC ±15% (11.7 to 15.8V)		
	Ground		Negative		
	Current drain	Transmit mode	Less than 8A		
		Receiver mode	Less than 0.6A		
	Frequency stability		less than ±10ppm		
	Dimensions (W × H × D) (Projections included)		140(5-1/2") × 40(1-37/64") × 200(7-7/8") (141(5-9/16") × 42(1-21/32") × 212(8-11/32"))		
Weight		1.4kg (3.11lbs)			
TRANSMITTER	output power*	HI	25W		
		MID	10W		
		LOW	Approx. 2W		
	Modulation		Reactance modulation		
	Spurious radiation		Less than -60dB		
	Maximum frequency deviation		±5kHz		
	Audio distortion (at 60% modulation)		Less than 3% (300 to 3000 Hz)		
	Microphone impedance		500 to 600Ω		
Circuitry		Double conversion superheterodyne			
RECEIVER	Intermediate frequency	1st/2nd	144MHz : 16.9MHz/455kHz 440MHz : 21.6MHz/455kHz	144MHz : 30.3MHz/455kHz 430MHz : 30.825MHz/455kHz	
	Sensitivity (12dB SINAD)		Less than 0.16μv		
	Selectivity		-6dB : More than 12kHz, -60dB : Less than 24kHz		
	Squelch sensitivity		Less than 0.1μV		
	Output (5% distortion)		More than 2W across 8Ω load (5% distortion)		
	External speaker impedance		8Ω		

- Notes : 1. Circuit and ratings are subject to change without notice due to advancement in technology.  
2. \*Recommended duty cycle : 1 minute ; Transmission, 3 minutes, Reception

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